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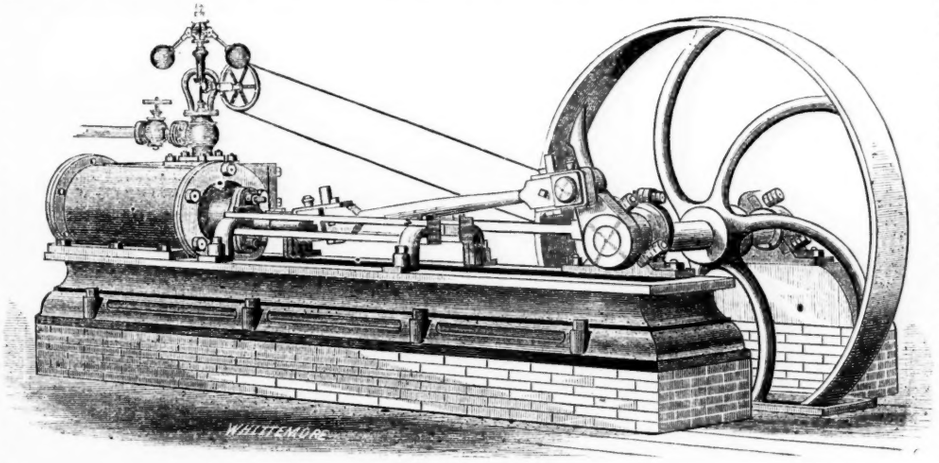
HORIZONTAL STEAM ENGINES.

The illustaation which we give this week represents a stationary engine adapted for driving saw and other mills, and for use in manufactories. The necessity for great simplicity in all machines used in our mining regions—entailing in their distance from all skilled labor a considerable expense attending any repairs consequent on the disarrangement of complicated machinery—must be apparent to every thinking mind. Yet when simplicity is carried so far as to exclude all improvements, no advantage can be gained thereby. The manufacturers of this engine maintain that while they sought for great strength and simplicity in design, they have also introduced many improvements. The bed plate is cast in such a manner that the iron gives great strength in proportion to its weight. The eccentric rod runs direct to the valve stem, thus avoiding rock shafts and similar contrivances. The foundation bolts screw upon the outside of the frame. With each engine is furnished a governor, a feed pump driven by a band from the crank shaft, a heater connected with the engine by pipes, and the foundation bolts. These engines are manufactured by the Alberton & Douglass Machine Co., New London, Conn., in whose workshops will be found many other kinds of engines. Their advertisement appears in another column, and visitors to New York can examine specimens at the machine depot of Messrs. Hutchinson & Laurence, No. 8 Dey street.



THE ALBERTSON & DOUGLASS HORIZONTAL ENGINE.

Mineral Resources of the Pacific Coast.

In an article upon this subject, the San Francisco *Alta* says: Gold, silver, quicksilver and copper, are the only metals which the coast now yields in any considerable quantity. A little platina is obtained, and there are rich veins of iron, lead, antimony and tin in the State, but they are not worked. Of the non-metallic minerals, coal is the most important, and of that the annual production is about 80,000 tons, all of it from Monte Diablo. The borax lakes in Lake county are the richest sources of that mineral known, and the production of refined borax is becoming important. The porcelain clay of Michigan Bar is of a very fine and valuable quality. The felspar of Calaveras is considered equal to any for fine ceramic use. The Plumbage or Columbia, according to the report of exports, is as good as that of the best English mine which is opened for only a few days in the year, and is a source of vast profit to its owners. The stealite, or soapstone, of El Dorado is excellent in quality. Rumor says that marble as white as that of Carrara is found in Tuolume and Shasta counties, and the variegated marble of Indian Diggings is unsurpassed in beauty of color and susceptibility of polish. Beautiful alabaster is found in Placer, El Dorando, Los Angeles and Solano counties. There is a manganese mine on Red Rock. Vast beds of sulphur are found in various parts of the State, and the business of refining it has been established in the Lake county. Our deposits of asphaltum are extensive, and large quantities of it sent to market. Petroleum exists in the rocks from Humboldt to San Diego, and the production is slowly but steadily increasing. An opal mine near Mokelumne Hill is regularly worked; and diamonds, emeralds and rubies have been obtained in the placer. There is alum in Santa Clara county, sulphate of magnesia in Lake county, and crude soda in vast quantities in the Colorado and Mohave deserts. Common salt is made from the sea-water in considerable quantities in Alameda and Santa Barbara counties. Yellow ochre, sienna and umber, and an iron ore that can readily be made into Venetian red, are among the resources of California. Numerous other minerals might be added, but they are either found in very small quantity, or little importance is attached to them. The list, however, as we have given it, is surely remarked for its variety, and mineralogists will seek in vain for its like in any other State or country of equal area.

Ross Browne Again.

Since we ventilated the report of Commissioner Browne, several journals have paid their respects to it. The Colorado papers handle it without gloves. In one of them, the *Register*, the writer says: "The AMERICAN JOURNAL OF MINING severely criticises Mr. Browne's report, but not half severely enough. So far from telling anything new, he does'nt tell a hundredth part of what has been told by the mining papers a thousand times, nor does he tell it half so well." The *Transcript* says: "Sending him to report upon our mines is like sending a long-haired preacher from the east to treat with the Indians. One knows about as much about his business as the other." And the Denver *Gazette* remarks: "If Ross Browne has not been more careful with his other returns, we trust those whom it may concern, in a legislative sense, will divide his statistical total by the figure 3, and take the result instead of the one he has handed in."

Aluminium.

M. Degousse, a gold beater in Paris, has succeeded in preparing aluminium in fine plates, like gold or silver; in this state it is readily combustible, burning in the flame of a spirit lamp with great brilliancy; a square inch weighs only one milligramme (.01544 gr.) If a leaf be pressed together, placed in a bulb, and heated by means of a spirit lamp in a current of oxygen, it burns with a dazzling, lightning-like appearance. Aluminium wire also burns in oxygen like iron. Aluminium leaf decomposes boiling water, although the compact metal does not.

Spanish Coal Mines.

Mr. Consul Dunlop, in his consular report, observes that it has surprised him since he has been in Andalusia to notice that, although considerable amounts have been (sometimes profitably) invested in other mining throughout Spain, very littte attention has been given to her coal fields. Coal formations are formed in Andalusia, at Belmez, and Espiel; at San Francisco del Monte, and Adamaz, in the province of Cordova; and between Guadalcanal and San Nicola del Puerto, near the river Riar, and also at Villanueva del Rio, in the province of Seville.

Manufactured Mineral Oils.

Petroleum and Parraffine are manufactured in Wales and Scotland from the shale or refuse of the bituminous coal beds. It is estimated that about twenty gallons of crude oil are obtained from a ton of coal, and that between seven or eight millions of gallons per annum are manufactured in the retorts of Scotland alone. The principal supply is from the oil wells of Pennsylvania.

Quick Travel.

The time between Omaha and Salt Lake City now is only eight days. Three of them are occupied in the trip from Omaha to Denver, and the remaining five from Denver to Salt Lake City. In this eight days' travel there are three hundred miles of railroading, and nine hundred of staging—total, 1200 miles.

Mining Summary.

THE GOLD AND SILVER MINES EAST OF THE ROCKY MOUNTAINS.

Official Report of U. S. Commissioner Taylor.

We are indebted to U. S. Senator Conness for a copy of the preliminary Report of James W. Taylor, Special Commissioner for the collection of statistics upon gold and silver mining East of the Rocky Mountains. Leaving out the introductory matter, we publish this valuable report entire, to the exclusion of our usual summary of current mining intelligence, believing that our readers will be glad to have it in this shape for future reference. The report, shorn of introduction, runs thus :

THE ROCKY MOUNTAINS.

This designation no longer includes the whole breadth of the Andean chain in the United States. It refers only to the formation known in Mexico as the Sierra Madre, or Mother mountain, from which the Sierra Nevada of California, or the western wall of the mountain mass, diverges in northern Mexico, while the intervening plateau of table lands is now recognized as a distinct and characteristic division of the continent. The Rocky mountains, or the cordillera of the Sierra Madre, traverse the territory of the United States in a north-northwest direction, from the 29th to the 49th parallel of latitude. The average elevation of its crest is 12,000 feet above the sea, lifting for a breadth of 300 miles, above the altitude of its eastern and western piedmonts, which, in the latitude of Denver and Great Salt Lake, is fully 6,000. Those valleys, slopes, and gorges, which supply the sources of the Missouri, Yellowstone, Platte, Arkansas, and Rio Grande rivers, are the prominent features of the Territories of Montana, Colorado, and New Mexico, and will be the first topics of consideration in relation to gold and silver mining east of the Rocky mountains.

NEW MEXICO.

If we compare a map of this Territory with any similar publication of the last century, even as early as a chart in Moll's atlas of 1720, the vicinity of Santa Fé is represented as even more populous than at present. The Spaniards thoroughly explored the valley of the Rio Grande, and their mining settlements were very numerous in the mountains of New Mexico. There is a tradition that the Indians, whose labor had made the mines of gold, silver, and copper available to their Spanish conquerers, were at length driven into insurrection, which was so far successful as completely to interrupt all systematic mining. This was about 1680, and at no subsequent period have the conditions of society and industry been favorable to the resumption of mining enterprises. At this time Indian hostilities prevent permanent labor, and almost exploration, in the remote districts of New Mexico.

Twenty years ago, when Col. Doniphan led a column of American troops to Santa Fé and Chihuahua, Dr. A. Wizlizenus, who accompanied the expedition as surgeon and for the sake of scientific investigation, reported that gold was found to a large extent in all the mountains near Santa Fé, south to a distance of about one hundred miles, or as far as Gran Quivira, and north for about one hundred and twenty miles, to the river Sangre de Cristo. Throughout this whole region gold-dust was then abundantly found by the poorer classes of Mexicans, who occupied themselves with the washing of this metal in the mountain streams, while at the Placer mountain, about thirty miles from Santa Fé, gold-bearing quartz was worked. These statements in regard to gold are confirmed by the second annual message of acting Governor Arny, delivered in December, 1866, to the legislature of New Mexico, who also reports the discovery of thirty lodes of gold-bearing quartz at Pinos Altos, paying from $40 to $200 per ton; of quartz veins at San José, in the Sierra Madre, intersecting each other in all directions for a mile in width and three miles in length; of a similar formation near Fort Davis, Texas; and of extensive placer mines, on the San Francisco and Mimbres rivers.

Governor Arny gives prominence to those gold discoveries, but adds that silver is the prominent and most abundant mineral of the Territory. Lodes of silver, with its many combinations, are very numerous. He thinks it will be the most profitable branch of mining in that Rocky mountain region, and enumerates as prominently argentiferous the districts of the Placer mountains near Santa Fé, the Organ mountains near the Mesilla valley, and the Sierra Madre near Pinos. The first and last of these localities are, as we have seen, gold-producing also. In the Organ mountains over fifty silver mines have been discovered, the ore being generally argentiferous galena. The district near Mesilla valley in the Organ mountains has a mean altitude of 4,400 feet, and is intersected with ravines, affording favorable opportunities for horizontal drifts in opening the veins. There is a belt or series of veins containing six principal veins and many smaller ones, the six larger veins varying from two to fifteen feet in width. On the largest of these veins is the celebrated "Stephenson" mine. This belt of veins crosses the Orgon mountains at or near the San Augustine pass, and both sides of the chain of mountains present similar features and equal richness. The country bordering on the north portion of Chihuahua is a rich silver district. Immediately adjoining the new Mexican boundary are the mines of "Corralitos," the most successful silver mines in the State of Chihuahua, having been mined for forty years in a region most exposed to Indian hostility. Near the old town of El Paso, tradition places the locality of one of the richest silver mines known to the Spaniards, but its site was lost during the insurrection of 1680.

Dr. Wizlizenus, writing in 1847, thus proceeds with his enumeration of the mineral resources of New Mexico : "In Spanish times, several rich silver mines were worked at Avo, at Cerillos, and in the Nambe mountains, but none at present. Copper is found in abundance throughout the country, but principally at Los Tijeras, Jemas, Abiquin, Guadelupita de Mora, &c.; iron, though also abundantly found, is entirely overlooked. Coal has been discovered in several localities, as in the Raton mountains, near the village of Jemez, southwest of Santa Fé, and near, but south of, Placer mountain. Gypsum, both common and selenite, is found in large quantities, extensive layers of it existing in the mountains near Algodones, on the Rio Grande, and in the neighborhood of the celebrated Salinas. It is used as common lime for whitewashing, and the crystalline, or selenite, instead of window-glass. About one hundred miles south-southeast of Santa Fé, on the high table-land between the Rio Grande and Pecos, are some extensive salt lakes, or salinas, from which all the salt (muriate of soda) used in New Mexico is procured."

Governor Arny, in his late message, observes of the production of copper, that, before the late civil war, two copper mines were extensively worked—the Santa Rita and the Hanover—turning out about twelve tons of copper per week, and employing jointly about five hundred hands. Other copper mines had been opened and were about to commence operations. A copper mine has lately been discovered a short distance from Fort Union, the specimens indicating a rich deposit. The locality of this discovery will render it very valuable, as it is convenient for the return wagons from Santa Fé and Fort Union to the Missouri river.

The indispensable conditions to the development of the mines of New Mexico are, first, Indian pacification; second, railway communication with New Orleans, Vicksburg, Memphis, and St. Louis; third, a geological reconnoissance.

Some additional statements, on the authority of Dr. Wizlizenus, in regard to the mineral production of the adjoining State of Chihuahua, are valuable as indicating what may be reasonably anticipated in New Mexico. Referring to the rich silver mines of Chihuahua, he remarks that they are found principally in the western part of the State throughout the length of the Sierra Madre, and in a mean breadth of thirty leagues. The ores occur generally as sulphurets, with iron or lead, sometimes as native silver and muriate of silver, and are found either entirely in porphyritic rocks, or in stratified rocks, (limestone,) passing at greater depth into igneous rocks. They are worked either by amalgamation or by fire in common furnaces. For the latter process they need generally an addition of greta, (litharge or oxyd of lead,) which forms, therefore, a valuable article of trade.

The celebrated mine of Santa Eulalie, near the city of Chihuahua, produced in seventy-two years, from 1717 to 1789, $52,800,000. The abundance of lead found in Santa Eulalia makes the smelting of the ore very convenient. These mines are not exhausted; but from intrusion of water, want of capital, and the attraction of new mines, they are but little worked. Dr. Wizlizenus describes five other districts where silver ores have been found far superior in richness and extent to the mines of Central Mexico, but in which little has been accomplished on account of the invasions of hostile Indians; and he mentions gold and copper mines as holding a similar relation to the lodes of silver, as prevails in New Mexico. The annual production of silver and gold in 1846 was estimated at about $1,031,251.

COLORADO.

The summits and valleys of Colorado are the sources of the rivers Platte and Arkansas, which are affluents of the Mississippi, and of the Rio Grande, directly tributary to the Gulf of Mexico, and of the Colorado, which falls into the Pacific gulf of that name. No similar area of the Rocky mountains is more imposing in scenery or physical relations than Colorado. Its mineral development is fully commensurate.

The traveller by the route of the Union Pacific railway, in approaching the Rocky mountains, will first traverse a formation of coal and iron. For over one hundred and fifty miles, from the Arkansas to the Cache le Poudre, bituminous coal, or a superior quality of lignite, has been discovered, at many points accompanied by iron ore. Next in situation westward—quite within the mountains, but much below their snow-covered summits—is a mineral range from five to fifteen miles wide, and extending from Long's Peak two hundred miles southwardly in Colorado, within which most of the discoveries of gold, especially of auriferous quartz, have occurred. Crossing the snowy range, on the western slope, extensive silver mines have been discovered. Governor Evans, of Colorado, in November, 1866, remarked at a public meeting in Chicago : "I have just returned from visiting a district about one hundred miles by ten or fifteen in extent, lying across the main mountain range west of Denver City, which is pervaded throughout by extensive and rich veins of silver; some are of pure silver ores, but the majority of them are argentiferous galena ores, varying in thickness, many of them yielding in the smelting furnace as high as six hundred dollars of silver to the ton of ore." Salinas, or extensive deposits of salt, are accessible, as in New Mexico; and even petroleum is found near the eastern base of the mountains. The forests supply timber even for exportation to Kansas, and the mountain streams are generally available for the uses of machinery and irrigation.

The area of Colorado is 67,723,520 acres, and the most sanguine view of its future agriculture is comprised in a statement by Surveyor General Pierce, in 1866, that "there are about 4,000,000 acres of agricultural land susceptible of irrigation, which will make productive farms;" 250,000 acres were entered under the homestead and pre-emption acts in 1866, and 141,000 acres in 1865. A much larger area is suitable for the sustenance of domestic animals. "The whole of the plains," according the testimony of Governor Evans, "and the parks in the montains of Colorado, are the finest of pastoral lands. Stock fattens and thrives on them the year round, large herds and flocks being kept there in the finest possible condition. In some parts, it is true, the snow covers the grass for a part of the winter, but in other places cattle and sheep are wintered without feeding, with entire success. The celebrated parks, Nerth, Middle, South and San Luis, are fine agricultural valleys for grass and small grains."

Gulch or placer mining, although the first form of gold discovery in 1859, has been prosecuted in Colorado with less success than in California—a remark applicable to all the districts east of the Rocky mountains, with perhaps the single exception of the Confederate gulch near Helena, in Montana Territory. This may be owing to the less degree of disintegration to which the veins, or gold geologically *in situ*, have been exposed. It has been observed that on the eastern flank of the great Rocky mountain mass volcanic and other igneous action has been less violent, the country is less abrupt, and the action of the elements has been less marked than on the Pacific slope, and therefore placers are not so frequent or productive. Whatever may be the force of this explanation, the discoveries and development of auriferous quartz lodes in the Gregory district have mostly contributed thus far to the settlement of Colorado. This district extends from Gold Hill to Empire City, about thirty miles along the base of the snowy range, and is, on the average, about ten miles in width—an area of three hundred square miles of gold-producing mountains, in which many quartz mills are in operation. It is now generally admitted that the range of gold-bearing quartz is not limited to the Gregory district, but is as extensive as the snowy range itself.

The successful reduction of auriferous rock is a problem of the future. The immense production of Siberia, California and Australia is mostly washed from the sands of rivers or the adjacent detritus, nature, in each, case having overcome the mechanical and chemical difficulties presented by the matrix of gold. In the reduction of Colorado ores the chemical are the chief difficulties. The auriferous quartz of the Sierra Nevada, when pulverized, yields the gold readily to the attraction of quicksilver—the gold is "free;" but, with hardly an exception, a Colorado mine exhibits a most refractory combination of gold with the sulphurets of iron and copper. Nor are these the only mineral associations which often baffle all former appliances for the separation of baser metals. Quartz mining in Colorado has hitherto been unsuccessful from the failure of numerous processes and methods of desulphurization and amalgamation which has proved efficient in Europe and even in California; but during 1866 several American inventions, or new combinations of existing methods, have been introduced, and are now in course of trial. I shall not venture to describe their practical operation or decide upon their success. Hereafter, as a result of personal examination and a full comparison of opinion, it may be practicable to do so; but at present there is no subject which would more appropriately command the attention of a scientific commission.

The mechanical obstructions to workrng a gold mine in Colorado are very great. In working a vein or lode, the iron or copper pyrites are usually separated from surface quartz by what is called cap, or a shutting up of the vein by the wall rock. This is the great difficulty in opening a mine—it recurs in descending, but the intrusion is less and less. The Montgomery district in southern Colorado will afford an illustration. First, the blossom rock, desulphurized by the action of the atmosphere, was readily crushed and yielded its gold to amalgamation; but soon the surface ore was exhaused; it became necessary to traverse the cap rock, often 150 feet deep, which was a tedious and expensive process, but at length the indurated pyritous ore was reached, very productive of gold, but requiring to be removed and reduced at a great cost of time, labor, capital and skill. Still, as some compensation, the testimony is quite general that the mine widens and grows more productive of gold at its lower stages.

The auriferous veins of Colorado are represented to be from six inches to nine feet in width. Governor Evans claims that in most of the lodes now worked the quartz rock yields an average of thirty-six dollars per ton, but that a production threefold greater may be expected when the reduction of ores reaches the perfection of a scientific assay. Lodes in California with present facilities of labor, transportation, and supplies, are found to pay the owner, if $10 per ton gross can be obtained from the rock. In Nevada, over the mountains, only three hundred miles from the coast, and with very considerable advantages of transportation by turnpikes, a lode must yield $25 gross per ton to reward the owner for working it; and this statement may be made in regard to quartz mining in Colorado, while in New Mexico and Montana, even with security from Indian hostilities, a lode must yield $40 per ton to pay. If the advantages in prices, freights, etc., which exist in California, were supplied to the interior by railroads, all the mining territories would profitably develop their quartz mines at $10 per ton gross product.

MONTANA.

Of the streams which unite to form the Missouri river, the Jefferson, or most western tributary, has the principal scene of gold discovery. In the summer of 1862 a party of Minnesota emigrants crossed the northern plains destined to the Salmon river mines. On reaching the Rocky Mountains they found parties of prospectors upon the Prickly Pear and Beaver Head branches of the Jefferson, and in the Deer Lodge valley, upon the remote tributaries of the Columbia. In September these explorations were successful on Grasshopper creek, a tributary of the Beaver Head, and the placer mines of Bannock City soon attracted a considerable mining population. In May, 1863, a discovery of bar or placer mines was made about fifteen miles west of Bannock, on Horse Prairie creek, another branck of the Beaver Head. It was of limited extent, but quite productive. In June, 1863, there were further discoveries of placer mines about seventy miles east of Bannock, on Alder creek, a tributary of the Jefferson. These have proved of much larger extent and richness, extending continuously more than fifteen miles. Virginia City is in their vicinity. These two districts are respectively about fifty miles eastward from the summits of the Rocky Mountains, being within the semicircular park which the Rocky Mountains enclose between latitudes 44° to 46° and longitude 112° to 114°. A still more remarkable development of gulch or placer mining occurred in 1865 at Helena, a district about one hundred and thirty miles east of north from Virginia City, but still two hundred miles southwest of Fort Benton, ascending the course of the Missouri and the Jefferson. Some of the statements in regard to Confederate gulch, near Helena, are difficult of belief. It is said that during three months of the summer of 1866 three miners took 2,100 pounds of gold, or $441.000, from a space three rods square, on Montana bar, in Confederate gulch. A total production of $15,000,000 to $20,000,000 for 1866 is also claimed.

There are many inducements to exaggeration in these statements. For some years after the California discovery the demand for coinage induced large deposits at the government mints, but for the last half of the period since 1848 a great proportion of the gold and silver product in the United States has been cast into bars or ingots by private assayers. This proportion may now be stated at fully one-half. Since, therefore, the United States mints and assay office report $5,505,687 30 from Montana for the fiscal year ending June 30, 1866, it will be safe to double that amount as the probable production in that year. A communication to the Treasury Department from an intelligent citizen of Montana only claimed $6.000,000 as the production of 1865. The following statement is more likely to be correct than the bulk of newspaper reports:

1863	$2,000,000
1864	5,000,000
1865	6,000,000
1866	12,000,000
	$25.000,000

Considerable progress has been made in quartz mining. Over two hundred lodes have been opened sufficiently to prove their value. The average yield of the vein-rock is stated at forty dollars per ton. There are seventeen quartz mills in the Territory, of which ten are in operation. Thirty are in process of erection. In the vicinity of the mining centres enumerated—Bannock, Virginia, and Helena—2,500 lodes represented to be in gold-bearing have been prospected and titles recorded.

About the first of June, 1864, ores of argentiferous galena, of which some indications had been previously observed, were discovered to be valuable. The first silver mines were opened in Rattlesnake creek, a branch of Beaver Head river, about fifteen miles north of Bannock. Then followed, during the summer of 1864, discoveries of similar veins in the Prickly Pear region, within three or four miles of Bannock, in a district about twenty-four miles northeastwardly of Virginia City, near gulches known as the Mill and Wisconsin, and upon the mountains enclosing Deer Dodge valley. These silver veins, although bearing more or less gold, are not necessarily connected with the gold districts hitherto explored; and a geological exploration would probably show that the silver deposits of Montana are more extensive, with a probability of becoming more productive, than the gold mines. The assays of argentiferous galena have exhibited results from $100 to $1,700 per ton. Three furnaces for smelting silver are in operation—one at Bannock, one at Argenta, on a tributary of the Beaver Head, and the third in the valley of the Boulder, a tributary of the Jefferson.

Upon the foregoing basis of exploration and discovery in Montana, the population may be estimated as follows:

Jefferson and Edgarton counties, including Prickly Pear and Helena districts	12.000
Madison county, Virginia City	7,000
Beaver Head county, Bannock City	2,000
Deer Lodge valley (western slope)	3.000
Bitter Root valley (western slope)	1,000
Fort Benton and vicinity	1,000
Other parts of the Territory	2,000
	28,000

It is now well ascertained that the coal, iron and petroleum formations observed in Colorado are extended northward under the same conditions and in equal proportion along the eastern flank of the Rocky mountains and far into British territory. As the general level of the plains at Fort Benton and vicinity is also ascertained to be about four thousand feet above the sea, or two thousand feet less than the altitude of Denver, there is no appreciable difference of climate between these localities, and the remarks in regard to agriculture and stock-raising in Colorado will equally apply to Montana.

In the autumn of 1866 a large number of copper lodes was discovered on the head-waters of the Muscleshell river, which yield from thirty to seventy per cent. of the pure copper, in crevices ranging from four to six feet in width. The metal is found in combination with the oxide and green carbonate of copper. These copper mines are convenient to the wagon road from Helena to the mouth of the Muscleshell, which is substantially the head of steamboat navigation on the Missouri river.

Near the old Mormon settlement at Fort Lemhi, near the head-waters of Salmon river, important gold discoveries in 1866 have attracted population—a settlement forty miles distant from Bannock city, and having business relations almost exclusively with Montana.

UTAH.

The dominant ecclesiastical organization of Utah is adverse to mining for gold and silver, although iron and copper mines have been worked successfully in the Wabsatch mountains. The general testimony is that silver will be discovered in many localities. Sixty miles south of Great Salt Lake City veins of argentiferous galena in Rush river district have proved valuable, and mining operations, including the construction of furnaces, are well advanced. These ores assay two hundred and sixty ounces of silver. Coal for the supply of Great Salt Lake city is mined at a distance of forty miles. An extensive silver district, in the southwestern angle of Utah, was lately transferred to the State of Nevada.

DAKOTA.

In addition to the Missouri and Yellowstone mines of Montana, under the average longitude of 110 deg., the explorations of Lieut. G. K. Warren, in 1847, and of Capt. W. F. Reynolds, in 1859 and 1860, under directions of the United States topographical office, have satisfactorily established that the Black hills of Dakota Territory, situated on the forty-fourth parallel of latitude and between the 103d and 105th meridians of longitude, are rich in gold and silver, as well as coal, iron, copper, and pine forests.

The area occupied by the Black hills, as delineated on a map which accompanies Lieutenant Warren's report, is 6,000 square miles, or about the surface of Connecticut. Their bases are elevated from 2,500 to 3,500 feet, and the highest peaks are about 6,700 feet above the ocean level. The whole geological range of rocks, from the granite and metamorphosed azoic to the cretacious formations of the surrounding plains, are developed by the upheaval of the mountain mass. Thus, at the junction of silurian rocks, gold becomes accessible, while the carboniferous strata bring coal measures within reach.

With the pacification of the Sioux Indians, and the establishment of emigrant roads, this district of Dakota would doubtless be the scene of great mining excitement, as the gold-field of the Black hills is accessible at a distance of one hundred and twenty miles from the Missouri river.

SASKATCHEWAN.

As early as 1862, some American explorers washed from the bed of the North Saskatchewan river, at a distance of two hundred miles from its extreme sources in the Rocky mountains, minute particles of gold, but with no return exceeding one cent to the pan or five dollars per day. In subsequent years the emigrants from Selkirk settlement, and a few American adventurers, obtained more satisfactory results, there being frequent instances of ten dollars a day as a daily average, from bars or gulches nearer the mountains. As the Montana explorations have advanced towards the international frontier, each encampment proving more productive than its predecessors, the opinion has prevailed that the sources of the Saskatchewan would develop rich deposits of gold and silver, especially near the great centre of physical disturbance, where Mount Hooker reaches an elevation of 16,000 feet, and Mount Brown 15,700 feet above the sea, and from which the waters of the Saskatchewan, Peace, Frazer and Columbia rivers diverge to three oceans. So prevalent is this belief in Montana that a sudden migration of thousands may at any moment be anticipated. Probably the intelligence received in Oregon during November, 1866, that American prospectors at the Kootonais mines had passed the mountains on or beyond the boundary of 49 deg. and found rich washings, returning even $60 to the hand, on the sources of the South Saskatchewan, will, if fully confirmed, be the signal of a movement over the border into the Saskatchewan basin as remarkable as that which filled the valley of Frazer river with miners from California and Oregon in 1859.

VERMILLION DISTRICT.

In 1865, attention was directed to discoveries of gold and silver northwest of Lake Superior, in the State of Minnesota. Lake Vermillion, an expansion of a stream of that name, is the centre of the district in question. The outline of this lake is very irregular. With a diameter of thirty miles, its surface is so studded with islands, its shores so broken with bays and headlands, that the entire coast line cannot be less than two hundred miles in extent. In 1848, D. J. G. Norwood, of Owens' geological survey, passed from the mouth of the St. Louis river, at the western extremity of Lake Superior, to the sources of the Vermillion river, and descending through the lake to the Rainy river, furnished a sketch of its natural features and mineral exposures. His statements are repeated, so far as they record the usual indications of a gold formation.

Before entering Vermillion lake from the south, Dr. Norwood mentions a perpendicular fall of eight feet over "silicious slate, hard and gray, with minute grains of iron pyrites sparsely disseminated through it." This rock bears east and west, with thin seams of quartz between the laminæ running in the line of bearing. There are also irregular patches of quartz from eight to ten feet long, and from six to twelve inches wide, which cross the strike at right angles. The river is broken by falls three-quarters of a mile above, or south of Lake Vermillion.

The islands in the lake indicate very distinctly volcanic action, one of them being an extinct crater. The prevalent rocks are talcose slate, which Dr. Norwood describes as "eminently magnesian, thinly laminated, and traversed by numerous veins of quartz from an inch to five feet wide, some of which contain beautiful crystals of iron pyrites." He adds, that "from some indications noticed, other more valuable minerals will probably be found associated with it." A specimen obtained about midway of the lake is catalogued as "quartz of reddish brown color; crystalline, with yellow iron pyrites, crystallized as well as foliated, desseminated through it."

These quartz veins were ascertained in 1865-'66 to be auriferous. A specimen weighing three pounds, containing copper pyrites, was forwarded by the Governor of Minnesota to the mint in Philadelphia, and upon assay, was found to contain $23 60 of gold and $4 42 of silver per ton of 2,000 pounds. The State geologist, Mr. H. H. Eames, reports an abundant supply of quartz equal in richness. Other assays in New York—in one instance, by officers of the United States assay office—show results from $10 to $35 per ton. There are rumors of larger proportions, but the above are fully authenticated. Professor J. V. Z. Blaney, of Chicago, describes a vein ten feet in width, at the foot of a shaft of fifty feet, which is "indubitably gold-bearing;" and adds, "that specimens taken from its central portion, as proven by assay, would be sufficient in California, Colorado, and other successful mining regions, to warrant further exploration." Washings of the drift near the veins opened have produced gold, but in limited quantities.

The productiveness of the Vermillion mines is not yet determined, but will be tested by several mining organizations during the current year.

CANADIAN MINES.

When in 1862 gold was discovered upon the sources of the Saskatchewan, a newspaper at Selkirk settlement, the *Norwester*, published statements of the existence of gold between Lake Superior and Lake Winnipeg. Since the Vermillion discovery, rumors of its extension into British America are prevalent, and suggest a probability that the mountain chain known to geographers as the Laurentian, which separates the waters of the St. Lawrence and its lakes from the tributaries of Hudson Bay, may reveal to future explorers extensive deposits of gold and silver. The basin of the St. Lawrence, including the sandstones of Lake Superior, is a low silurian formation; that of Hudson Bay, granitic or primary, with many evidences in Minnesota, and along the Canadian shore of Lake Superior, of eruptive or igneous agencies.

Sir Roderick Murchison has frequently advanced the opinion that the productive gold districts of the world occur where the silurian, and perhaps the lower strata of devonian rocks are in contact with, or have been penetrated by, greenstones, porphyries, serpentine, granitic and other rocks of the primary formation. Gold, especially when traced to its original matrix, is found to occur chiefly in veins or lodes of quartz rising from beneath and cutting through the

secondary strata or beds of which the surface was previously composed. These conditions are observed in the Vermillion district, and Professor Owen, as early as 1850, traced in this locality of Minnesota, and northeastwardly along the north shore of Lake Superior, in Canada, what he denominates a "a great plutonic chain," and "the main axis of dislocation," from which silurian sandstones extend southwardly through Wisconsin and Minnesota, while on the north the streams which are turned towards Hudson Bay traverse a region exclusively granitic, or primary. If in Minnesota an auriferous belt has marked this line of junction, we may with reason anticipate its extension eastwardly into Canada, and northwestwardly towards Lake Winnipeg. Indeed, as English explorers trace this contact of primary and silurian formations along the basins of Lakes Slave and Athabasca, and the channel of the Mackenzie to the Arctic ocean, it becomes an interesting problem for future solution, whether the auriferous deposits of British Columbia and Saskatchewan may not be extended with various degrees of productiveness along the crest which separates the waters of the Gulfs of Mexico and St. Lawrence from those of the Arctic ocean and Hudson Bay, quite as the discoveries of this century now follow the Ural mines eastward through Siberia to the Pacific.

The intrusion of granitic rocks is not confined in Minnesota to the northeastern angle of the State. It has been traced southwestwardly, near Sauk Rapids, upon the Upper Minnesota, and even to the northwestern boundary of Iowa, in a wedge-like shape, although covered in most places by the mass of drift which constitutes so large a portion of the surface of Minnesota. A similar granitic cape, with its associated minerals, may be the explanation of the alleged gold deposits in the township of Madoc, near Kingston, in Canada West.

In regard to the Madoc mines, the only facts fully established at the date of this report are, that Chicago parties have become purchasers of fifteen acres, the principal locality of the alleged discovery, for the sum of $35,000; that at an excavation of six feet, made originally in search of copper, gold in considerable quantities has been found in coarse sand, in decayed quartz, and also in a cream-colored quartz that abounded in a crevice and its surroundings; and that an assistant of Sir William Logan, the government geologist, has written a letter to *L'Oudre*, of Montreal, in which he says that the mine—"the Richardson"—"is as remarkable for its richness as for the manner of its existence," and that "he sees in the Richardson the best as well as the most encouraging of all indications for the search of gold in Upper Canada." A correspondent of the New York *Tribune*, apparently disinterested, and writing from the vicinity January 22, 1867, asserts that "some thousands of dollars of native gold have already been secured from this mine and other adjacent localities, and sold in Belleville, Canada West, to jewellers, who pronounced it a very good quality, fully equal to that of Australia." This section of Canada is also known to abound in copper, iron, lead, slate, and marble.

The Chaudiere mines, near Quebec, are probably a development of the Alleghanian range. They have hitherto been confined to placer or alluvial mining on the tributaries of the Chaudiere. Quartz mining has not been prosecuted to any great extent, although an official publication by the Canadian government reports assays at $21, $37, and even $95 per ton.

NOVA SCOTIA.

The gold fields of Nova Scotia consist of some ten or twelve districts of quite limited area in themselves, but lying scattered along the southeastern coast of the province. The whole of this coast, from Cape Sable on the west to Cape Canso on the east, a distance of about two hundred and fifty miles, is bordered by a fringe of hard, slaty rocks, slate and sandstone in irregular alternations, sometimes argillaceous and occasionally granitic. These rocks are always, when stratified, found standing in a high angle, sometimes almost vertical, and with a course in the main very nearly due east and west. They seldom rise to any great elevation, the promontory of Aspatagon, about five hundred feet high, being the highest land on the Atlantic coast of the province. The general aspect of the shore is low, rocky and desolate, strewn often with large boulders of granite or quartzite. This zone of metamorphic rocks varies in width from six or eight miles at its western extremity to forty or fifty at its widest points, presenting in its northern boundary only a rude parallelism with its southern margin, and composing about six thousand square miles of surface, the general outline of what may, geologically speaking, be called the gold region of Nova Scotia.

A contributor to the *Atlantic Monthly* magazine for May, 1865, enumerates Tangier Harbor, Wine Harbor, Sherbrooke, Evans, Oldham, Waverly, Stormont, and Lake Loon—a small lake only five miles distant from Halifax—as localities which have fully determined the auriferous character of the district already described, and selects for specific description, and as a specimen of other veins, the Montague lode at Lake Loon. The course of this is E. 10° N., that being the *strike* of the rocks by the compass in that particular district. It has been traced by surface-digging a long distance—not less, probably, than half a mile. At one point on this line there is a shift or fault in the rocks, which has heaved the most productive portion of the vein about thirty-five feet to the north; but for the rest of the distance, so far as yet open, the whole lode remains true and undisturbed.

Its dip with the rocks around it is almost vertical, say from 85° to 80° south. The vein is contained between walls of slate on both sides, and is a double or composite vein, being formed, first, of the main leader; second, of a smaller vein on the other side, side, with a thin slate partition-wall between the two; and third, of a strongly mineralized slate foot-wall, which is in itself really a most valuable portion of the ore-channel.

The quartz which composes these interposed sheets, thus separated, yet combined, is crystallized throughout, and highly mineralized; belonging, in fact, to the first class of quartz lodes recognized in all the general descriptions of the veins of this region. The associated minerals are, here, cuprite or yellow copper, green malachite or carbonate of copper, mispickel or arsenical pyrites, zinc blende, sesquioxide of iron, rich in gold, and also frequent "sights" or visible masses of gold itself. The gold is also often visible to the naked eye in all the associated minerals, and particularly in the mispickel and blende.

The main quartz vein of this interesting lode varies from three to ten inches at different points on the surface-level, but is reported as increasing to twenty inches thick at the bottom of the shaft, already carried down to a depth of forty feet. This very considerable variation in thickness will be found to be owing to the folds or plications of the vein, to which we shall hereafter make more particular allusion.

The minerals associated with the quartz in this vein, especially the cuprite and mispickel, are found most abundantly upon the foot-wall side, or underside, of the quartz itself. The smaller accompanying vein before alluded to appears to be but a repetition of the larger one in all its essential characteristics, and is believed by the scientific examiners to be fully as well charged with gold. That this is likely to come up to a very remarkable standard of productiveness, perhaps more so than any known vein in the world, to be inferred from the official statement in the *Royal Gazette* of Wednesday, January 20, 1864, published by authority of the chief gold commissioner's office in Halifax, in which the average yield of the Montague vein for the month of October, 1863, is given as 3 oz. 3 dwt. 4 gr.; for November, as 3 oz. 10 dwt. 13 gr.; and for December, as 5 oz. 9 dwt. 8 gr., to the ton of quartz crushed during these months, respectively. Nor is the quartz of this vein the only trustworthy source of yield. The underlying bunches of slate is filled with mispickel, not distributed in a sheet or in any particular order, so far as yet observed, but developed throughout the slate, and varying in size from that of small nuts to many pounds in weight—masses of over fifty pounds having been frequently taken out. This peculiar mineral has always proved highly auriferous in this locality, and a careful search will rarely fail to detect "sights" of the precious metals imbedded in its folds, or lying hidden between its crystalline folds.

Nor is the surrounding mass of slate in which this vein is enclosed without abundant evidences of a highly auriferous character. Scales of gold are everywhere to be seen between its laminæ, and, when removed and subjected to the proceeds of "dressing," there can be little doubt of its also yielding a very handsome return. In fact, the entire mass of material, which is known to be auriferous, is not less than twelve to fifteen inches at the surface, and will doubtless be found, as all experience and analogy in the district have hitherto shown to be the case, to increase very considerably with the increased depth to which the shafts will soon be carried. No difficulties whatever are apprehended here in going to a very considerable depth, as the slate is not hard and easily permits the miner, in his progress, to bear in upon it without drilling upon the closer and more tenacious quartz.

The open cut made by the original owners of the Montague property, and by which the veins have been in some degree exposed, absurd and culpable as it is as a mode of mining, has yet served a good purpose in showing in a very distinct manner the structure of these veins—a structure which is found to be on the whole very general in the province. The quartz is not found, as might naturally be supposed from its position among sedimentary rocks, lying in anything like a plain, even sheet of equal thickness. On the contrary, it is seen to be marked with folds or plications, occurring at tolerably regular intervals, and crossing the vein at an angle of 40° or 45° to the west. Similar folds may be produced in a sheet which is bung on a line, and then drawn at one of the lowest corners. The cross-section of the vein is thus made to resemble somewhat the appearance of a chain of long links, the rolls or swells alternating with the plain spaces through its whole extent. Perhaps a better comparison is that of ripples or gentle waves as seen following each other on the ebb-tide in a still time on the beach.

The distribution of the gold in the mass of the quartz appears to be highly influenced by the peculiar wavy or folded structure. All the miners are agreed in the statement that the gold abounds most at the swells or highest points of the waves of rock, and that the scarcely less valuable mispickel appears to follow the same law. The spaces between are not found to be so rich as these points of undulation; and this structure must explain the signal contrast in thickness and productiveness which is everywhere seen in sinking a shaft in this district. As the cutting passes through one of these swells the thickness of the vein at once increases, and again diminishes with equal certainty as the work proceeds; below this point destined again to go through with similar alternations in its mass.

The gold of Nova Scotia is remarkable for its great purity, it being on the average twenty-two carats fine, as shown by repeated assay. The bars or ingots are current in Halifax at $20 an ounce. Assays by Prof. Silliman, of Yale College, have ascertained values of $19 97 and $20 25, and the gold commissioner of Nova Scotia assumes $19 50 as the basis of his calculations of the gold product of the province.

The official returns of the deputy gold commissioners for the several districts to the chief commissioner at Halifax are unusually exact and reliable in regard to the most important point of the whole subject, namely, the average yield per ton of quartz crushed at the mills. By regulations of the mining department, every miner, or the agent or chief superintendent of each mine, is required, under penalty of forfeiting possession of the mine, to make a quarterly return of the amount of days' labor expended, the number of tons raised and crushed, and the quantity of gold. These returns are not likely to be exaggerated, as a government royalty of three per cent. on the gross product is exacted. Besides the miner's report, all owners of quartz mills are required to render official returns under oath, and in a form minutely prescribed by the provincial law, of all quartz crushed by them during each month, stating particularly from what mine it was raised, for whose account it has been crushed, and what was the exact quantity in ounces, pennyweights and grains. Upon this basis it appears that the average for all the mining districts is $30 per ton; while the maximum yield at some of the prominent mines has been $1,000 per ton at Wine Harbor, $240 at Sherbrook, $220 at Oldham, and $100 at Stormont, during the months of October, November, and December, 1863. These results are independent of the great waste which attends the reduction of pyritous ores. The cost of reduction at this time does not exceed $7 per ton, owing to the moderate scale of prices for labor, supplies and fuel in Nova Scotia.

The writer in the *Atlantic Monthly*, already referred to, accounts for the absence of alluvial gold by the peninsular formation of Nova Scotia. The action of the glacial period would only transport the detritus of auriferous rocks beneath the Atlantic ocean. Therefore, the gold of Nova Scotia is to be successfully sought under the application of the most scientific and systematic methods of deep quartz mining. His summary of these methods is so suggestive that it will be cited:

"The ill-considered system of alloting small individual claims at first adopted by the colonial government was founded, probably, on a want of exact knowledge of the peculiar nature of the gold district, and the consequent expectation that the experiences of California and Australia in panning and washing were to be repeated here. This totally inapplicable system in a manner compelled the early single adventurers to abandon their claims as soon as the surface-water began to accumulate in their little open pits or shallow levels, beyond the control of a single bucket or other such primitive contrivance for bailing. Even the more active and industrious digger soon found his own difficulties to accumulate just in proportion to his own superior measure of activity, since, as soon as he carried his own excavation a foot or two deeper than his neighbors, he found that it only gave him the privilege of draining for the whole of the less enterprising diggers, whose pits had not been sunk to the same level as his own. Thus the adventurers who should ordinarily have been the most successful were soon drowned out by the accumulated waters from the adjacent and sometimes abandoned claims. Nearly all of these early efforts at individual mining are now discontinued, and the claims thus shown to be worthless in single hands have been consolidated in the large companies, who alone possess the means to work them with unity and success.

"The present method of working the lodes, as now practiced in Nova Scotia, proceed on a very different plan. Shafts are sunk, at intervals of about three hundred feet, on the course of the lodes which it is proposed to work, as these are distinctly traced on the surface of the ground. When these shafts have been carried down to the depth of sixty feet, or, in miner's language, ten fathoms, horizontal drifts or levels are pushed out from them, below the ground, and in either direction, still keeping on the course of the lode. While these subterranean levels are being thus extended, the shafts are again to be continued downwards, until the depth of twenty fathoms, or one hundred and twenty feet, has been attained. A second and lower set of levels are then pushed out beneath, and parallel to, the first named. At the depth of thirty fathoms a third and still lower set of levels will extend beneath and parallel to the second. The work of sinking vertical shafts, and excavating horizontal levels to connect them, belong to what is denominated

the 'construction of the mine,' and it is only after this has been completed that the work of mining proper can be said to begin.

"The removal of the ore, as conducted from the levels by which access to it has thus been gained, may be carried on either by 'direct' or by 'inverted grades'—that this, either by breaking it up from underneath, or down from overhead, in each of the levels which have now been described, or, as it is more commonly called in mining language, by 'understoping' or by 'overstoping.' When the breadth of the lode is equal to that of the level, it is perhaps not very material which plan be adopted. But when, as at Oldham, Montague or Tangier, the lodes are only of moderate width, and much barren rock, however soft and yielding, has of necessity to be removed along with the ore, so as to give a free passage for the miner through the whole extent of the drifts, we shall easily understand that the working by inverted grades, or 'overstoping,' is the only proper or feasible method. In this case, the blasts being all made from the roof, or 'back' as it is called, of the drift, the barren or 'dead' rock, containing no gold, is left on the floor of the drift, and there is then only the labor and expense of bringing the valuable quartz itself, a much less amount in bulk, to the surface of the ground. The accumulating mass of the dead rock underfoot will then be constantly raising the floor of the drift, and as constantly bringing the miners within convenient working distance of the receding roof. In the case of 'understoping,' however, in which the blasts are made from the floor of the drift, it will be perceived that all the rock which is moved, of whatever kind, must equally be brought to the surface, which entails much greater labor and expense in the hoisting; and moreover, instead of co-operating with, counteracts, it will be understood, the effective force of the powder."

There is quite a concurrence of testimony that the quartz seams increase in richness as they descend, although the excavations have not, as yet, been carried to depths exceeding one hundred feet.

The mining statistics of Nova Scotia exhibit very accurately the average yield per man, which, in 1863, was 95 cents a day; in 1864, $1 39; and in 1865, $2 13. At the rate per diem last mentioned, each man employed produced $684 40 per annum. The Australian estimate of the production per man of the mining population do not exceed an annual average, since 1851, of $500.

The value of gold produced in Nova Scotia during the year ending September 30, 1865, was $509,080 (paying $18,038 in rents and royalties); in 1864, $400,440; in 1863, $280,020; and in 1862, $145,500. The earliest discovery of gold occurred in 1860. The productiveness of the mines was not diminished during 1866.

ALLEGHANY GOLD-FIELD.

It can only be determined by a geological exploration, which shall embrace Lower Canada, Maine, New Brunswick, Nova Scotia, and Newfoundland, whether the gold formation of Nova Scotia is associated with the Laurentian range, or is an extension of the auriferous belt which, first observed upon the Coosa river in Alabama, extends in a general northeast direction along the eastern flank of the Alleghanies to the Potomac river, with some partial developments in Maryland, Pennsylvania, Vermont, and New Hampshire, and upon the Chaudiere river, of Lower Canada. In the latter case, the mining experience of Nova Scotia may yield valuable suggestions in regard to the auriferous lodes which are known to be very numerous in the talcose and chloritic schists of the southern Alleghanies. Since the California discovery of 1848, little attention has been given to alluvial mining in Virginia, the Carolinas, and Georgia; and until recently capitalists have acquiesced in the opinion, so confidently expressed by Sir Roderick Murchison in "Siluria" and other publications, that, notwithstanding numerous filaments and traces of gold near their surface, the Alleghany vein-stones held no body of ore downwards which would warrant deep quartz mining. At present, with twenty years' experience in gold mining; with the testimony of miners in Colorado that a lode apparently closed by cap-rock can be recovered, with increased richness, at a lower depth; with other analogies, however imperfect, from the successful treatment of pyritous ores in Nova Scotia; and with the earnest application of inventive minds to new and improved processes of desulphurization, it is evident that the working of the southern mines will be resumed, perhaps with the encouragement of a scientific survey under the auspices of the general government.

The deposits of gold at the United States mint and its branches between 1804 and 1866, from the States traversed by the Appalachian gold-field, are reported as follows:

Virginia	$1,570,182 82
North Carolina	9,278 627 67
South Carolina	1,353,663 98
Georgia	6,971,681 50
Alabama	201,734 83
	$19,375,890 80

If we admit that an equal quantity passed into manufactures or foreign commerce without deposit for coinage, the aggregate production would be about $40,000,000, of which fully three-fourths, or $30,000,000, was mined between 1828 and 1848.

It is not the purpose of this report to enumerate the enterprises now organizing for the development of the Alleghany mines, but to recall some evidence, mostly compiled before the California discovery, in regard to their situation and mineralogical characteristics.

VIRGINIA.

The gold veins of Virginia extend through Fairfax, Prince William, Fauquier, Culpepper, Orange, Spottsylvania, Louisa, Fluvanna, Goochland, Buckingham, and a few adjoining counties.

In 1837, Professor Benjamin Silliman published (Journal of Science, first series, vol. 32, p. 98) the results of a personal examination of mines in the vicinity of Fredericksburg, of which a brief summary will be given. He describes the gold-bearing quartz as embedded in talcose and mica slate, principally the latter. In far the greater number of cases the eye detects nothing but quartz, or sometimes metallic sulphurets of iron, zinc, or lead, and the observer, unless previously instructed, would never suspect the presence of gold, either distinct or in the metallic sulphurets. In the vicinity of the quartz veins rich washings occur. In Spottsylvania county, on a branch near the White hill mine, $10,000 was taken in a few days from a space twenty feet square, and $7,000 was found near Tinder's mine, in Louisa county, in the course of one week. It often happened that successful alluvial mining preceded the discovery of vein mines. Of the latter several are described:

1. Busty's mine, situated fifty miles from Richmond and fifty-three miles from Fredericksburg, in solid quartz veins, fifteen to eighteen inches thick, at depth of twenty-two feet; structure of vein coarsely granular, like loaf-sugar, free from foreign matter except inherent gold, and so white that even when pulverized it showed no tint of color; yield on one trial $80 per ton; on another trial $240 per ton.

2. Moss mine, near the above; situated in decomposed slate-rock; surface of vein little else than red clay, but firmer, and stratified below; inclination of rock and included quartz vein about 45 deg.; direction by compass north by east, and south by west; diameter of vein sixteen, eighteen, twenty-four, twenty-seven, and thirty inches, averaging twenty-four inches; quartz luminar, easily broken and separated from slate by blasting, but showing no signs of gold, though examined by a magnifier; three tests returned $100, $140, and $200 per ton, yet in neither case was gold visible in quartz or ore.

3. Walton mine, situated in Louisa county, forty miles southwest of Fredericksburg; quartz vein firm and compact; one foot wide; occasionally porous and interspersed with iron pyrites and a dark iron ore, probably proceeding from their decomposition: penetrated by two shafts of seventy and forty feet; first trial of poor ore, $80; second trial of average ore, $160; third trial of ore taken at random, $400; fourth trial of specimen, showing gold to the naked eye, $2,660 per ton; average of the series of assays, $820 per ton.

4. Culpepper mine, situated eighteen miles west of Fredericksburg, upon the Rapidan; a tract of 524 acres; hydraulic power for a twenty-stamp mill; four adits with connecting shafts: main vein ten feet wide, but prone to divide into strings not larger than a finger, nearly parallel and separated only by portions of the slaty rock; gold more abundant in these strings than in larger veins; much iron accompanying the ore; pulverized quartz always red or brown; iron pyrites in some places fresh and brilliant, elsewhere decomposed; strata nearly perpendicular; specimens from fourteen localities, mixed together, returned $30 per ton; specimen from a vein considered rich, but showing no sign of gold, gave $80 per ton.

In the following paragraph, Professor Silliman only anticipates the experience of miners at this day:

"Gold is often found in pyritical ores in which the gold is embedded in fine particles. This mass when reduced to fine powder gives a residuum of oxidized iron about equal in weight to the fine gold, the latter being malleable or flattened, while the former, being brittle, remains rounded or angular. In washing this mixture in the pan the gold generally remains on the upper side of the mass, and is therefore more liable to be washed off by the slightest ripple of the water. On the other hand, when the gold is embedded in quartz ores, especially those with fine fractures, called in Virginia 'sugar ore,' or more properly granular quartz, the gold being of a similar form, is more quickly disengaged, and appears in larger grains.

"On the contrary, the ferruginous grains, or iron sand, are so fine as to be scarcely visible, and are invariably found at the bottom of the mass or residuum, and therefore, as well as on account of their greater weight, are much less liable to be carried off by the ripple of the waters."

Several successful instances of alluvial mining near the Rapidan are also mentioned; on a Hempstead farm, $4,000 in 1831-'32, of which nearly $3,000 in sixty days; another instance two or three miles from Rapidan, $12,000; a third, $40,000; all in the vicinity of the Culpepper mine.

The most remarkable of the foregoing statements relate to the assays of ores from the Walton mine. Professor Rogers, of the University of Virginia, inspected this mine in 1836, and ascertained that in the lower adit leading from the main shaft, the auriferous vein was twelve inches in width, and that the talcose rock underlying the vein was also auriferous to a distance of six inches, and sometimes more, from the quartz. He also observed the continued yield from the quartz, and the uniform dissemination of the gold throughout the vein, and the lower enclosing rock. An assay by Professor Rogers returned $280 per ton.

A writer in Harper's Monthly Magazine for December, 1865, describes the gold mines in the vicinity of Richmond; having previously given some general information of the conditions under which gold has been discovered and mined. "Sienite, gneiss, greenstone, and porphyry," he says, "appear to be the primary sources, and the pyrites are evidently the immediate matrix of gold. All iron pyrites contain gold, and often silver, only excepting those of the coal formation; and the extensive gold deposits of Virginia may be said to be literally one continuous belt or accumulation of veins of iron pyrites.

"Most of the gold-bearing rock which has hitherto been mined in Virginia is principally a kind of talcose slate, somewhat resembling soapstone, but not so greasy to the touch. This slate is red and ferruginous at the surface, but at a greater depth is filled with small crystals of iron pyrites which are decomposed near the surface and appear as peroxyd of iron, giving the slate a brown or yellow tinge. This slate is a metamorphic rock, and runs in a regular belt parallel with the Alleghany mountain chain.

"The gold found in the State of Virginia occurs in exceedingly small grains, often so fine as to be not only invisible to the naked eye, but indiscernible even by the assistance of a strong lens. This is the case even when the ores are worth three or four dollars per bushel. Some veins of the slate region contain coarse gold in grains as large as the head of a pin, and even larger. These are generally found in veins of quartz in which the pyrites are concentrated into larger masses. Where the pyrites are disseminated in fine crystals through the mass of rock, the gold is found to be very fine. In the first pyrites the gold is often invisible, even if after separation it appears to be coarse. By natural or artificial decomposition the gold becomes visible, the pyrites are converted into oxyd of iron, and, by aid of a lens, the gold can be detected imbedded in the oxyd of iron. Another form in which the native gold is not unfrequently found in Virginia is in quartz, in which it is imbedded. Solid white quartz, both in veins and in crystals, is found, in which the gold appears in spangles, plates, grains, and also in perfectly developed crystals. Throughout the gold regions of Virginia copper pyrites are found in all the metallic deposits. It invariably accompanies the gold-bearing iron pyrites, and is always considered a good indication of richness. Cases have often occurred in which the largest amount of treasure has been abandoned, because the miners had not the knowledge of proper appliances for separating the precious yield of gold and copper."

The writer of the article here quoted proceeds to give many interesting details of the gold mines of Goochland, Buckingham, and Fluvanna counties. Among these are the Belzoro mine, developing seven veins, which vary in width from two feet six inches to thirty feet; Marks mine, with four gold-bearing quartz veins; Waller mine, vein of brown oxyd of iron, six feet thick; Tellurium mine, sold in 1848 to Commodore Stockton, who is reported to have extracted $250,000 in nine years; Snead gold mine, of three veins, one of them being four feet wide, and composed of white quartz, which contains argentiferous galena, copper sulphates, and gold; Ford mine, revealing copper pyrites largely; and Lightfoot mine, with four well-known and very rich veins; all of which have been worked successfully at different periods since 1828.

The mineral wealth of Virginia in other respects is unsurpassed by Pennsylvania or any other part of the Union.

NORTH CAROLINA.

The gold district of North Carolina extends from northeast to southwest in the general direction of its leading counties, namely: Guilford, Randolph, Davidson, Rowan, Stanly, Cabarrus, Mecklenburg, and Union.

In 1825 Professor Denison Olmstead designated as the district within which alluvial mining was prosecuted, the counties of Montgomery and Anson, and the eastern portions of Mecklenburg and Cabarrus as then organized. Gold was first discovered in a "thin stratum of gravel enclosed in a dense clay, usually of a pale blue, but sometimes of a yellow color." This description is easily recognizable as the detritus of the gold-bearing rock afterwards discovered further to the west. Many facts of the early success of placer mining on the tributaries of the Pedee might be adduced, but it must suffice, in this connection, to repeat from Wheeler's History of North Carolina an enumeration of the nuggets which have been obtained since the first discovery in 1799:

Years.	Pounds.	Years.	Pounds.
1799	4	1826	16
1803	28	1826	9½
1804	9	1826	8
1804	7	1835	13¾
1804	3	1835	4½
1804	2	1835	5
1804	1¼	1835	8

No more intelligible account of the placers of North

Carolina exist than the communication of Professor Olmstead in 1825, from which a few paragraphs will be given. After describing the gold-bearing alluvium as "gravel enclosed in pale blue or yellow clay," he adds: "On ground that is elevated and exposed to be washed by rains this stratum frequently appears at the surface, and in low grounds, where the alluvial earth has been accumulated by the same agent, it is found at the depth of eight feet; but where no cause operates to alter its original depth it lies about three feet below the surface. A miner sometimes meets a stratum of the ferruginous oxide of manganese in a rotten, friable state. In some instances the clay is deep red."

Very soon, however, these gold deposits were traced to the auriferous lodes traversing a belt of talcose, micaceous, chloritic, and hornblende slates, which passes through several counties on the east side of another belt of granite and west of one of trap. These veins, as early as 1828, were described as follows by Charles E. Rothe, a miner and mineralogist from Saxony: "They occur in greenstone formation often from two to four feet in thickness and a mile or more in length, which give assurance that they sink to a considerable depth. Their general direction is east and west, dipping occasionally 40° to 50° north. The ores and minerals in these veins are rhomboidal iron ore, prismatic iron ore, pyramidal copper pyrites, and prismatic iron pyrites. In the last two is a mechanical mixture with each other. They show distinct signs of having been changed from their original form. Where the atmosphere could have any influence on the pyrites we find that one part of the sulphur has escaped, the consequence of which is, the metallic appearance of the pyrites is changed to that of a brown-reddish oxide of iron, and owing to this color we can see the fine particles of gold, and ascertain the richness of the deposit. But where the pyrites have not undergone this change, then the gold cannot be discovered, owing to the color being nearly the same. The green stone near the vein is most generally decomposed, and mixed with a great number of loose crystals of prismatic iron pyrites. Between the greenstone and the vein, or at the place of junction, the gold is most generally found."

The gold district of North Carolina is the second belt of the table-land, its positions moderately elevated, and it is very seldom that the highest hills of Davidson, Randolph, Rowan, Cabarrus, and Mecklenburg counties are traversed by vein fissures.

In 1857 a report by Ebenezer Emmons, upon the geology of the midland counties of North Carolina, was published, which gives a detailed description of thirty mining localities. Abstracts of his observations upon the leading mines of Guilford, Randolph, Davidson, Rowan, Stanly, Cabarrus, Mecklenburg, and Union counties will best illustrate the characteristics of the auriferous belt through the State. The order in which these counties are named coincides with their geographical position, commencing on the north:

1. McCulloch mine, in Guilford county, brown or desulphurized ore, to a depth of one hundred and thirty feet; vein two feet wide at surface, increasing to twenty four feet, with a dip at angle of forty-five degrees; brown ore, soft and easily crushed, yielding $30 to $40 per ton, and sometimes $100; at level of one hundred and thirty feet, there are six inches brown ore on foot-wall, then copper pyrites, then a belt of brown ore containing nodules or concretions of pyrites more or less changed, the middle of which is rich in gold, and then the principal mass of porous quartz against hanging wall, which, though sometimes showing films of gold, is usually poor; wall rock, sienitic granite.

2. Fisher Hill, in Randolph county; veinstone quartz, with white sulphuret of iron mixed irregularly through it; free from copper pyrites; burnt to advantage; two to four feet wide near surface; brittle, and when burnt easily pulverized; average sixty dollars per ton, and gold worth ninety cents to pennyweight.

3. Conrad Hill, in Davidson county, six miles east of Lexington Court-House; situated eighty-eight feet above plain to the south; five gold-bearing veins from eighteen inches to two feet at surface; third vein fifteen inches at surface, widening to eighteen feet at a depth of one hundred feet, and finally developing sulphurets of iron and copper rich in gold; only four feet rich in gold; wall-rock talcose slate, but adjacent country traversed by trap.

4. Gold Hill, on southern border of Rowan county; product to 1856, $2,000,000; three strong and well-defined veins, one mile east of granitic belt; angle of dip 80°; strata undisturbed by eruptive rocks; veins associated with sulphurets of iron and copper; Earhardt vein worked 400 feet, expanding from six inches to seven feet, a succession of lenticular segments overlapping at their edges; chief difficulties, fineness of gold and heavy sulphurets; if sand saved and exposed for a year the sulphurets are decomposed and metal liberated; in 1854 $139,636 76 obtained in thirteen months from Gold Hill, expenses $60,331 06, profit $76,305.

5. Parker mine, in Stanly county; most productive parts of rock are natural joints or quartz seams; pieces in proximity to natural joints sometimes weighing a pound; "not a vein, but a decomposed mass with gold distributed in seams;" has produced $200,000; some masses at rate of eighty to one hundred dollars per ton.

6. Reed mine, in Cabarrus county; productive alluvial mining, as already stated; a vein at depth of ninety feet yields twenty-two dollars per ton. A Phœnix mine, in Cabarrus, was rich to 140 feet, twenty to sixty dollars per ton; but at that level white quartz and sulphate of barytes replaced the brown ore, reducing yield to five dollars per ton. The Pioneer mine, also in Cabarrus, is a fissure in granite sixteen to seventeen feet wide, but true veinstone eight or ten inches; gold in pure quartz mixed with sulphurets; yield sixty-three dollars per ton.

7. Howie and Lawson mine, in Union county, near the line of South Carolina; fine, white and granuler quartz which near contact with slate-wall rock is mottled with brown oxide of iron; on this surface gold visible; width of vein six to thirty inches; average sixty dollars per ton; some specimens two hundred and twenty dollars; traced three-quarters of a mile; sold in 1856 to Commodore Stockton.

8. Rudisill's mine, near Charlotte, Mecklenburg county; three veins, three or four feet wide: gangue slaty, with stripes of quartz and copper pyrites, yielding twenty dollars per ton; quartz brittle and readily crushed; "arrangement of ore in the lode is usually in rich bunches, connected by strings." Dunn mine, seven miles from Charlotte, remarkable for limonite produced from iron pyrites, but unproductive of gold. The gold in the vicinity of Charlotte is worth one dollar the pennyweight.

Copper mining has also received attention in North Carolina—the most persistent and prosperous enterprise of the kind being in Guilford county. The "Washington silver mine" in Davidson county, produces a great variety of metals in association with silver, which are difficult to treat metallurgically; but the attempt will doubtless be resumed with the aid of improved methods of amalgamation.

The mineral wealth of North Carolina is by no means confined to the eastern slope of the Blue Ridge. West of that range, between the Snowy mountain and the Blue Ridge, and its transverse from the upper waters of the French Broad river to the Lookout mountain, containing 5,000 square miles, there is a field presented to the mineralogist not perhaps equalled for extent and interest in the United States. Smoky mountain constitutes the line between primitive and transition rocks, and its acclivities are steep and broken, developing familiar and auriferous combinations. Gold has been taken from all its streams; and where the spurs and belts of this mountain have been cut by denudation, veins of quartz running with talcose slate are very apparent. Gold is often found in quartz rock, out of place, and much decomposed. Coco creek is a very rich deposit. Rumors of silver deposits were current in the army, during the late military campaigns. This remote interior district will amply reward exploration.

SOUTH CAROLINA.

The auriferous belt already traced from Fredericksburg to Charlotte extends to the vicinity of Abbeville, in South Carolina—more restricted in width, but with indications of greater richness.

Mines of Mr. William Dorne, in the Abbeville and Edgefield districts, yielded gold to the valne of $300,000 in fifteen months preceding July, 1853. The ore was highly ferruginous and silicious, and the gold was found among the layers of the vein in streaks and pockets of extraordinary richness. It was supposed to have been exhausted; but during 1866 work was resumed with satisfactory results.

Professor Lieber, State geologist of South Carolina, has reported that the most auriferous rocks are clay and talcose slates, catawberite, (a compound of talc and magnetic iron,) specular iron, schist and itaberite. None of the later formed rocks contain gold, and the mica slates, and other older formations, contain comparatively little. This is in accordance with the views of Murchison, already referred to, who refers the position of universally to veins in altered silurian slates, chiefly lower silurian, and most frequently near their junction with eruptive rocks.

The first mint deposits from South Carolina were $3,500 in 1829; the aggregate of such deposits to June 30, 1866, was $1,353,663 98.

GEORGIA.

The width of the gold range through the southern States is not yet defined. If narrower in South Carolina, it is wider in Georgia than elsewhere. A line crosses the State from Augusta on the Savannah, by Macon on the Ocmulgee, to Columbus on the Chattahoochee, north of which is a platform of granitic and palæozoic rocks, which stretches to the Alleghanies, within which gold occurs in almost every county. Near this southern limit a gold mine has been worked in Columbia county, not far from Augusta, which has been continuously productive for eighteen years. But with this breadth to the general auriferous formation, there is evidence of two belts, which are separated by unproductive metamorphic rocks. Probably the district of Georgia and Alabama, which is most distinctly and remarkably gold-bearing, is from latitude 34° to 35° and between longitude 83° and 86°.

Gold was first discovered in Habersham county about 1831. It was followed by numerous developments along a line of hornblende slate from Alabama, northeast through Cass, Cherokee, Hall and Hart counties, and extending to the Blue Ridge. Within this limit are the productive counties of Gilmer, Lumpkin, Habersham, and Rayburn.

A mint was established at Dahlonega, in Lumpkin county, in 1837, which has received $600,000 in a single year, with an aggregate coinage to February 28, 1861, of $6,121,919. Of this amount, $5,825,747 was received during the period from 1838 to 1857.

Placer mining has been prosecuted in northern Georgia in a manner and with a success not unlike the experience of California. Besides the true veins, which traverse the strata in which they lie in various angles of dip and direction, there are many depositories of gold in all directions around Dahlonega, which are auriferous beds of slates, often decomposed, and sometimes containing pyrites, and the gossan resulting from its decomposition. In Lumpkin and Habersham counties especially, these metalliferous beds have been worked like open quarries, and the gold, in some instances, has been collected with the rocker or the pan, without recourse to crushing; worked, in fact, like deposit mines. They contain rich nests and fine gold, most unequally diffused through the different layers among the slates; some are perfectly barren, in immediate contact with other streaks that may yield many dollars to the hundred-weight of material; but they are so intimately mixed that all must be treated alike when worked on the large scale. The immense quantities in which these materials are obtained, and the ease with which they are quarried, sometimes render it an object to work them, though their yield is, on the whole, very small. These conditions are very favorable to the application of hydraulic mining, as carried to perfection in California.*

Waiving further details, the following general observations may accompany this brief review of the Alleghany gold mines:

1. There is yet much room for the vigorous and intelligent prosecution of alluvial mining. Especially in Georgia, where the country is abrupt and nature has subjected the auriferous rocks to much dislocation and atmospheric exposure, not only the beds of the rivers, but the adjacent detritus of their valleys, will unquestionably give large returns to the new and powerful methods for washining pondrous masses of earth. It is understood that companies are now organized, who propose to introduce these hydraulic appliances upon the Chestatee and other tributaries of the Chattahoochee river.

2. There is abundant evidence also that the upper portions of auriferous lodes have been in a remarkable degree desulphurized, and may be worked to a considerable depth with great advantage before the intrusion of what is called "cap" in Colorado, or before the main body of the vein becomes obstinately pyritiferous. Surface quartz mining, if the phrase is admissible, will warrant considerable investments, whatever subsequent experience shall demonstrate in regard to the refractory sulphurets. It may be admitted that, hitherto, a quartz so modified in chemical constitution as to be "honey-combed," having become cellular and brittle from the decomposition of pyrites, with the gold set free from its matrix, is the only material which it is profitable to reduce; but the testimony is ample that immense quantities of ore in this favorable situation are accessible in the Alleghany gold district.

3. There are no grounds for the opinion that the auriferous lodes, strogly marked as they are by native sulphurets, will not prove true fissure veins, improving in quantity and quality with their depth. Professor Frederick Overman, in a work entiled "Practical Mineralogy," published in 1851, claims that the pyritous veins of Virginia and other south Atlantic States will be more sure and lasting than the gold-bearing localities of California. If the lower beds of Colorado mines can be raised and reduced with profit, deep sinking will be equally successful in the Carolinas.

NEW HAMPSHIRE AND OTHER LOCALITIES.

In the townships of Franconia and Lisbon, lying immediately north of Mount Washington on the lower Ammonoosuc river, gold has recently been discovered in quartz rock and a shaft sunk by a company of Boston capitalists to the depth of seventy-five feet. A correspondent of *American Exchange and Review*, a monthly publication of Philadelphia, describes the gold-bearing quartz as traversing talcose slate, and containing sulphurets of iron and copper and seams of of magnetic iron. Some extraordinary statements of recent assays from this locality have been published—one by Dr. Hays, State assayer of Massachusetts, at $867 of gold per ton, and another specimen of mixed quartz talcose slate, gossan, pyrites, etc., at $312 42 per ton. In the adjacent township of Waterford, surface quartz yielded $30 per ton; quartz taken at nineteen feet below the surface $45. Gulch mining has been successfully prosecuted in the vicinity.

If the New Hampshire discovery should warrant investments, there may be a renewal of exploration and

* See article "Gold," in Appleton's American Cyclopædia. The writer, who refers to his personal experience in Georgia mines, adds that when the ores are not pyritiferous, and there are facilities for stamping such as are used in cement mining by Californians, these materials can be profitably worked, when only producing eighty cents or one dollar per ton, or 1.8 part in $1,000,000; but, of course, where the material is hard quartz, and more especially if it is pyriferous, the expense of working would be more than quadruple. Prof. W. P. Blake, in 1857, published a pamphlet, advising the improved method of sluice-washing for use in Georgia.

experiment in Vermont, where the Appalachian mountain system is largely developed.

During the year 1863 lodes of argentiferous galena were traced in the vicinity of Marquette, on Lake Superior. This district is from ten to twenty feet in breadth and about fifty miles in length, and is situated between the schistose or iron range, and Lake Superior. Assays reveal from ten to thirty pounds of silver to the ton of metal. In the same vicinity east of Marquette the Huron mountains were reported in 1864 to be gold-bearing; but rumors have led to no practical results.

A geological exploration of Arkansas undertaken a few years since indicated the probability of profitable mining for silver, and perhaps gold, in the Ozark mountains of that State.

A district of Alabama, in the northeastern portion of the State, is a well-defined extension of the Appalachian gold-field. Its production of gold in the United States mint and branches has amounted to $201,734 83, with an equal amount probably diverted to commercial channels.

METALLURGICAL TREATMENT OF GOLD ORES.

A few general suggestions on the treatment of gold ores, and more particularly the auriferous sulphurets so prevalent in the formations east of the Rocky Mountains, are submitted.

The direct method of attacking these ores is by fire, as is always done by the assayer in his laboratory, when he wishes to extract from a sample of ore all the metal which it contains. Undoubtedly, when the cost of fuel, fluxes, and labor is reduced to something near the standard which prevails in the seaboard States, the richer ores of Colorado, Montana, etc., will be reduced by smelting. At present, however, there is reason to believe that the proper economic conditions for smelting do not exist, except possibly in the case of argentiferous galena; although experiments recently made at Swansea, England, upon large quantities of pyritic ores sent from Colorado have proved entirely successful. In conducting these experiments and estimating their cost, care was taken to make the conditions as to fuel, fluxes, labor, etc., the same as those existing in Colorado. It is stated that smelting works upon a large scale, upon the Swansea plan, are to be started immediately in Colorado. If this should be done, there will ensue a subdivision of labor in the business of mining gold and silver, as is now the case in iron mining. The miner will limit his efforts to the raising of ore from his mine, and the smelting furnace will afford a market where the ore will command its price. This will be better for all parties than the method hitherto pursued of raising and reducing ores under one administration.

But it will be a long time before the great mining regions of the Rocky Mountains will have a sufficient number of smelting works to meet the wants of our enterprising miners, who are constantly prospecting new fields; and there will always be a class of ores too poor to bear the cost of smelting.

The cheaper process of amalgamation, now universally employed in all our mining districts, (and, when no sulphurets are present, the very best process,) will continue to be very generally resorted to. This process consists in reducing the ore to a fine powder by means of stamps, arastras, Chilian mills, or other mechanical contrivance, and subjecting it to a continuous agitation with mercury, with water enough to give a pasty consistency to the mass, the object being to expose as fully as possible the fine particles of gold and silver to the attractive power of the mercury, with which they form an amalgam easily separable by subsidence in the lighter pulp of earthy matter of which the ore consists. The amalgam thus obtained, on being subjected to moderate heat in an iron retort, gives up its mercury, which passes over in vapor, and is condensed again in another vessel, the metal being left in the retort.

In the case of pyritic ores, however, it is found that the process of amalgamation is seriously retarded by the impurities with which gold and silver are associated. Probably the ores of Colorado do not yield, by simple amalgamation, an average of twenty per cent. of their assay value. A previous process of desulphurization is, therefore, indispensable; and how best to accomplish this is the problem which has occupied the attention of metallurgists for many years. Many methods have been advised, the majority of which, being merely empirical, have had but an ephemeral reputation.

As already intimated further details are reserved for a subsequent occasion, when an effort will be made to describe the various processes now in course of experiment.

The treatment of silver ores rests upon a far more satisfactory basis of chemical experience, and the different methods in successful use are clearly and accurately compiled in the last edition of Ure's Dictionary of Arts, Manufactures, and Mines.

TREASURE PRODUCT OF THE WORLD.

When America was discovered the gold and silver supply of Europe did not exceed $200,000,000, of which $60,000,000 was gold, and $140,000,000 was silver. According to the estimates of Humboldt sixty years elapsed before this aggregate of two hundred millions was doubled by the treasure product of America.

M. Chevalier estimates that the total amount of gold and silver in 1848, the epoch of the California discovery, was $8,500,000,000, of which one-third was gold. It will require thirty-two years, or from 1848 to 1880, to duplicate this supply, even if $250,000,000 is assumed to be the average annual production of gold and silver during that period.

We have the authority of Adam Smith that it was not until after 1570 that the increased supply from the American mines produced any appreciable effect upon prices. In 1550, or twenty years previously, the treasure stock of Europe had been doubled; and in 1570 it reached an aggregate of $600,000,000. To this point the product of the American mines was absorbed by the new demands of commerce. It was only until 1620, or fifty years later, with a further addition of $600,000,000 to the stock of money in circulation, that silver fell to about one-third of its former value, with a corresponding appreciation of prices. In these statements full allowance is made for the consumption of the precious metals by casualties, abrasion, and the arts.

Whatever may be said of the great social and commercial activities of the sixteenth century, the development of human industry and intelligence in the nineteenth century will prove far more effective for the absorption of the vast quantity of gold and silver now or hereafter produced.

The world in the sixteenth century received and assimilated three-fold the treasure supply of 1492 without material change of prices, which was postponed fifty years later, until a six-fold supply, or an aggregate of $1,200,000,000, had been applied to commercial uses. Then was observed a reduction to one-third of the former value of silver. If we compare the experience of the world since 1848, the stock of specie in that year of $8,500,000,000 will be doubled in 1880, without any other effect than to vitalize commerce; and $400,000,000 per annum can still be absorbed by the trade and intercourse of all the continents for twenty years thereafter, or until A. D. 1900, before the monetary situation will correspond with that of Europe in 1570, when the first effect upon exchangeable value of money is recorded.

We are assisted, by the experience of the sixteenth century, to the conclusion that an aggregate of $25,000,000,000 in the year 1900 will hold a similar relation to the trade and intercourse of mankind that the amount of $8,500,000,000 sustained to the population and commerce of the world in 1848. If, as early in the next century as 1920, the stock on hand should be increased six-fold, reaching a total of $50,000,000,000, it might be attended, as in 1620, by a sensible reduction in the exchangeable value of money; but this contingency is too remote and capable of satisfactory compensation to justify much solicitude in behalf of posterity.

There are indications that the large excess in the production of gold over that of silver, which, since 1848, has reversed the former relations of these metals, may be less marked in future. The vast quantities of gold produced since 1848 are mostly from placers—from the detritus of auriferous rocks. These surface mines are soon exhausted. In California, notwithstanding the skillful application of hydraulic power, the production of gold by gulch or placer mining has diminished from $60,000,000, in 1853 to $20,000,000 in 1866. Except for new discoveries, and some successful enterprises of quartz mining, the Australian supply of gold would have likewise diminished. Very few diggings hold a mining population longer than a single season. The "dust of gold" is soon gathered. It may be that Australia, Siberia, perhaps the sources of the Zambesi and the Nile in Africa, and northwest British America will, when further explored, reveal a great many districts where the surface deposits are rich and accessible; but each will be in turn a scene of great excitement and of rapid exhaustion, and, perhaps, before the close of the present century alluvial gold producing will be almost a tradition. This tendency is so apparent in every gold-producing community that public attention turns constantly, and with solicitude, to the separation of gold from its native matrix of rock as the only permanent means of production. But at that stage silver mining comes into successful competition with all existing methods for the reduction of auriferous rock. It has always been more profitable to work mines of silver than of gold, of which Mexico, during two centuries of experience, and the Pacific coast, during two decades, are illustrations.

There was very little mention of silver while the discovery and conquest of America were in progress. Among the vast mineral treasures of Montezuma, the quantity of silver was small compared with the gold. It was "El Dorado" which was eagerly sought for by European explorers. Each country was ransacked, with the forced labor of Indian slaves, for gold. This was the era of placer-mining in the American dominions of Spain. In consequence of the importation of gold, Isabella of Castile was obliged, as early as 1497, to modify greatly the relations of gold and silver at the mints. The Spanish sovereigns acknowleged the grant by the Pontiff, Alexander VI., of their discoveries "in India" by a donation of gold from Hayti. At length, however, after the discovery of the silver mines in Peru and Mexico, and when the experience of miners had elaborated a systematic industry, gold ceased to be of much practical importance, and silver became the leading metallic product of Spanish America. Of the coinage of Mexico from 1535 to 1845, $2,465,275,954 was of silver, and $126,981,021 of gold. Except for Brazil, the proportion in South America would be fully equal to that recorded in Mexico.

In the case of California, after many unsuccessful experiments, the reduction of auriferous lodes has been established. The veinstones, when pulverized, readily release the gold; there is a remarkable absence of refractory alloys; all the conditions, especially in Grass valley, are favorable. Yet the yield of gold does not exceed $90,000,0000 per annum, while on the eastern slope of the Sierra Nevada the annual production of silver, chiefly from the Comstock lode, amounts to $16,000,000 per annum.

As the mining territories are explored, the discoveries of argentiferous veins are reported in all directions. The interior of the vast mountain mass develops in Sonora, Chihuahua, Arizona, Nevada, Utah, New Mexico, Colorado, Idaho, and Montana, the identical formations and conditions which, in a lower latitude, characterize Durango, Zacatecas, Guanajuato, and the other well known silver districts of Mexico. With the exhaustion of the placers (perhaps a remote contingency) it is quite possible that the production of silver, as compared to gold, will be restored to the old ratio of three of silver to one of gold.

But at present, as well as for the last eighteen years, the ratio of production is reversed—three of gold to one of silver. The following statement is submitted as an approximation, carefully avoiding exaggeration, of the quantities of the precious metals produced in 1866:

United States	$60,000,000	$20,000,000	$80,000,000
Mexico & S. America	5,000,000	35,000,000	40,000,000
Australia	60,000,000	1,000,000	61,000,000
British America	5,000,000	500,000	5,500,000
Siberia	15,000,000	1,500,000	16,500,000
Elsewhere	5,000,000	2,000,000	7,000,000
Total	150,000,000	60,000,000	210,000,000

The annual production of silver since 1853 has not exceeded $50,000,000, or £10,000,000. Yet, within the period of fourteen years—from 1853 to 1866—the sum of £11,250,000 has been annually transported from European ports (including shipments from Egypt) to Asia. The aggregates of bullion exports were as follows:

Gold	£24,773,647
Silver	157,424,757
Total	£182,198,404

France alone, although the richest country of the world in the precious metals, has, since 1848, parted with $165,947,253 in silver and taken gold in exchange. This has resulted from a fall in the value of gold, as compared with silver, of 2½ per cent., which, by comparison of the course of exchanges between England, using a gold standard, and Hamburg and Amsterdam, using a silver standard, is the only monetary result of the excess of gold supply since 1848. Europe and America will substitute gold for silver as money, while Asia will probably continue to absorb silver for many years to come, before the ratio of currency to population now existing in Europe shall extend over the eastern world.

A brief statement will illustrate the extent of the oriental demand for the precious metals, which, now mostly confined to silver, will hereafter, or as soon as the world shall desire it, extend to gold. India, in 1857, had a circulating medium of $400,000,000 for the use of a population of 180,000,000, or $2 22 per capita. France has a population of 38,000,000, with a money supply of $910,000,000, or $24 per capita. Suppose China, Japan, and the other industrious populations of Asia to be in the situation of India, and that the current of bullion since 1853 has supplied the Asiatics with $3 per capita, there yet remains a difference of $21 per capita before the monetary level of France is attained, demanding a further supply of $21 per capita over a population of 600,000,000, or not less than $12,600,000,000.

The railway system will soon connect Europe and Asia, and constitutes a most important agency for the transfer of capital and distribution of money among the populations of the Eastern continent. Since the suppresion of the Indian mutiny, an English writer estimates that more than one hundred millions sterling have been added to the currency and reproductive capacity of India, mostly from England, in the construction of railroads and canals. There were 3,186 miles of railway in operation in 1865, having cost $86,000 per mile, and having been constructed with the aid of a guaranty of five per cent. to stockholders by the province of India. The system, for which the government indorsement is already given, will be 4,917 miles of railway, at an estimated cost of £77,500,000. These roads will relieve the government of liability when their earnings reach £25 per mile per mile per week, a point which the leading lines have nearly reached, and which all are destined to attain. Such is the success of Indian railways that their connection with Europe by the valley of the Euphrates, and their extension into China, will probably be accomplished within the next ten years. By that time Russia will have undertaken a railway from Moscow to Pekin, through southern Siberia—a great trunk line that would soon justify a series of southern lines, penetrating Central Asia over those leading caravan routes which have been the avenues of Asiatic commerce for centuries.

If an investment of $430,000,000 in 5,000 miles of railway is financially successful in Hindostan at this time, it may be anticipated that a population of 180,000,000 will warrant the enlargement of the system within the present century fully four-fold, which would be only a fifth of similar communications required and supported by an American or European community. Suppose such a ratio of railway construction extended over China, central and western Asia and Siberia, it would be only one mile for every 9,000 people; while in the United States there are 36,000 miles for 36,000,000 people, or a mile to every thousand; and yet the Asiatic ratio, moderate as it is, presents the startling result of 66,000 miles of railroad constructed by the expenditure of $5,676,000,000. Such a disbursement of European accumulations in Asia would go far to diffuse not only the blessings of civilization, but any excess of production from the gold and silver mines of the world.

In Australia a railway has been constructed from Melbourne to the Ballarat gold fields, 380 miles, at a cost of $175,000 per mile, which pays a net profit nearly equal to the interest on the immense investment. It is difficult to estimate the amounts destined to be absorbed for railways in all the continents, under the direction of the great powers of the world—projected, constructed, and administered by the wealth and intelligence of America, Russia, England, Germany, and France. But the railway system is but an instance, among many other causes, conducing, in the language of an eminent English writer,* "to augment the real wealth and resources of the world; to stimu-

* Tooke's History of Prices, vol. vi, p. 235, published in 1857.

(CONTINUED ON PAGE 396.)

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GEORGE FRANCIS DAWSON,
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TO OUR SUBSCRIBERS.

As a large number of subscriptions to the JOURNAL OF MINING are about to expire, and it will greatly facilitate the making out and classification of our lists of addresses in time for Volume III—*when the paper will be enlarged by the addition of four more pages*—we trust that subscribers will at once send on their remittances for the ensuing year. For the information of those who have not yet subscribed, we will state that the price will remain as heretofore, viz.: $4 00 per annum.

TAKE NOTICE.

That on and after the 30th inst., the AMERICAN JOURNAL OF MINING *will be enlarged to* TWENTY PAGES. Its rapidly increasing circulation and advertising patronage fully justify this step, which will doubtless be as acceptable to our many subscribers as it is to us, as we shall thereby be able to give to them each week a greater number of original papers, and other interesting and valuable reading matter. On that date the JOURNAL will enter upon its Third Volume; and we hope by that time to receive a large accession of NEW subscriptions. We are glad to know that all our old subscribers take so lively an interest, as their numerous letters prove, in the unexampled prosperity of this paper, and we hope that all our readers will show it to their friends, and get *them* to subscribe for the coming year. We wish them to work for the JOURNAL, so as to enable us still farther to increase our sphere of usefulness. The more they do for us, the more we shall do for them, as it is our purpose to keep on enlarging and improving the JOURNAL, just as fast as its increasing patronage shall warrant it.

ANOTHER BATCH OF ERRONEOUS ESTIMATES AS TO GOLD AND SILVER PRODUCTION.

In the report of United States Commissioner Taylor upon gold and silver mines and mining East of the Rocky Mountains, (see under the head of "Mining Summary," in this week's JOURNAL OF MINING,) he undertakes to estimate the annual production of gold and silver throughout the world, in the following figures:

	Gold.	Silver.	Total.
United States	$60,000,000	$20,000,000	$80,000,000
Mexico & S. America	5,000,000	35,000,000	40,000,000
Australia	60,000,000	1,000,000	61,000,000
British America	5,000,000	500,000	5,500,000
Siberia	15,000,000	1,500,000	16,500,000
Elsewhere	5,000,000	2,000,000	7,000,000
Total	150,000,000	60,000,000	210,000,000

The document, for which we are indebted to the distinguished Chairman of the Senate Committee on Mines and Mining, reached us so late in the week, that we have been unable to more than cursorily glance through it, and discover that, while it contains much valuable information, Commissioner Taylor, in his estimates of the world's annual production, has fallen into grievous error. His estimated production of gold and silver by the United States in 1866, viz.: $80,000,000, is pretty close upon our own (see JOURNAL OF MINING, Feb. 2nd,) of $81,000,000, and is just $1,000,000 nearer to the truth than was ours, because we overrated Colorado's yield; but we think his estimate for gold not quite high enough, and that for silver a little too high. Nevada, Idaho, Arizona, New Mexico, Michigan, are our silver producers. The silver yield of Nevada in 1866 (official) was $16,000,000, that of Idaho about $2,000,000, and of the others not more than $1,000,000, making $19,000,000 in all. However, this error is trivial, compared with that which he falls into in accrediting Australia with an annual gold yield of $60,000,000, which if true would make that country equal to the United States as a gold-producer. We doubt, indeed, whether half that sum would not more nearly represent Australia's production. Mexico, South America and British America are put down at $10,000,000 in gold, and $35,500,000 in silver, which is an under-estimate. Siberia is credited with $16,500,000 in gold and silver, which is not far from right, if he means by "Siberia" the Russian mines in the Ural Mountains—a horse, but of another color. The estimate for "Elsewhere," which is set down at $5,000,000 in gold and $2,000,000 in silver, is almost as far wrong as that for Australia, for this "Elsewhere" includes Central America (which during the past year has been yielding unusually well in gold and silver,) Spain, Prussia, Austria, Italy, Great Britain, and other parts af Europe, and the rest of the world, not mentioned by him. We cannot give the actual figures of production for each of those countries; but it should be remembered that England (of all others the least likely to yield precious metals,) produced, last year some $700,000 gold, and quite $1,000,000 silver; that the gold and silver mines of Austria and Germany (including Prussia) are still being diligently worked; that a number of Spain's long famous silver mines are still yielding largely; that Italy's gold mines (one of them, the Pestarena, averages between $30 and $40 to the ton,) are not to be overlooked; and, turning from Europe to Africa—which should also come within the "Elsewhere"—that the product of the Kong Mountain gold district, belonging to France, is so large that the annual gold coinage of the French mint is over $100,000,000. It strikes us that if the gold and silver products of all these regions were added together they would represent a sum so large as to make Commissioner Taylor's estimate for "Elsewhere" hide its miserable head in very shame.

NECESSITY FOR A NATIONAL BUREAU OF MINES AND MINING.

From an article attributed to the Washington *Chronicle* we learn that "a bill is now before Congress, introduced by Senator Stewart, of Nevada, and Representative Higby, of California, which provides for the establishment of a Mining Bureau, the general design and duties of which shall be to acquire and to diffuse among the people of the United States useful information on subjects connected with mines and mining, in the most general and comprehensive sense of those words." Such a Bureau has long been demanded by the great mining interest of this country, and we earnestly hope will be created by the present Congress. We are not informed as to the details of this important bill, but presume, from the title, that this Bureau will be a place to which any person can go and see complete cabinets of American minerals, learn of the latest discoveries in mining, metallurgy, etc., and become acquainted with the merits of the mines of our country, and the processes that have been most successful in extracting their wealth; where he can find a complete library of works on geology, mineralogy, metallurgy and mining; an Institution which shall publish periodical statistical reports of the condition of mining in the United States—not of the J. Ross Browne class, but original reports that shall be valuable from their *reliability;* in brief, such a Bureau as shall be a perfect up-to-date compendium of information as to mines, mining, the extraction of metals, etc., in this country. To properly sustain this Bureau, to enable it to be conducted so reliably and thoroughly as to be entirely satisfactory, it will be necessary to appropriate a considerable amount of money annually; but if, for every thousand dollars thus expended, the Nation reaps one hundred thousand, it will be a wise economy. If organized upon a liberal basis, and conducted with purity, there is no doubt that millions of dollars, now annually lost through sheer ignorance in the parting of gold and silver from their ores, may be saved by the free dissemination of the latest results of scientific inquiry in that direction. It will also give renewed confidence to both home and foreign capitalists, when they can go to headquarters and receive authentic official information as to the yield, cost of working, depth, prospects, etc., of any mine in the United States; and thus it shall come to pass that untold millions, now lying hidden away at home, or embarked in foreign enterprises not nearly so remunerative as this, shall be invested here in legitimate mining operations, and American mining shall become a larger element than ever in the development of our National Greatness.

EFFECT OF CLIMATE UPON MINING.

The *Tribune* of March 12th, alluding to the Pah-Ranagat silver region in the south-eastern portion of Nevada, states that: "Its climate, *permitting work throughout the entire year*, is a manifest advantage over the mountain regions of Idaho, Montana, Nevada und Oregon, where the winters are often very severe"—and thereby conveys the impression that mining operations cannot be conducted during winter in the mountainous regions of those States and Territories. This is far from being correct. Heavy snows and nipping cold weather may sometimes interfere with the working of placer diggings, but not with mining proper, which is prosecuted in the bowels of the earth, just as well in

cold as warm weather, because the temperature in a mine is higher in winter and lower in summer than at the surface. Neither does cold weather nor snows interfere with the reduction of ores by steam mills. On the contrary, if there is snow on the ground, the ore and fuel can be conveyed on sleighs at less cost, and with greater rapidity, than at any other time. Even in Montana, which hugs a long space of our northern National boundary line, winter never checks the working of mines and mills, and the following dispatch, dated Virginia City, Montana, just received by Mr. James W. Whitlach, relative to the product of the Whitlach-Union Mine, will show how they work in that latitude:

"Arrived here last evening. Shipped through National Bank 144 ounces bullion. The last clean up was $7,434, making a total (since Nov. 28th) of $80,567 50."

The fact is that climate appears to have no effect whatever upon quartz mining, whether we look in the direction of warm Peru or cold British Columbia, tropical Mexico or snowbound Montana, the sultry Kong Mountains of Western Africa or the icy Ural. Unlike agriculture, which depends so exclusively upon weather, mining flourishes in spite of heat, wind, rain, hail or snow.

MEETINGS.

Hudson River Slate Co., 25 Park Row, (office Abram Bell's Son,) March 21, between 12 and 1 o'clock; Indian Rock Oil Co., at 71 Broadway, March 20, 1 P. M.; Silver Creek Mining Co., at 60 City Exchange, Boston, April 1, 10 A. M.; Hancock Mining Co., at 26 Kilby street, Boston, March 19, 4 P. M; George's Creek Coal and Iron Co., at 19 South street, Baltimore, April 2, between 1 and 2 P. M.; Santa Clara Mining Association, at 6 North street, Baltimore, April 1, between 12 and 2 o'clock; New Jersey Oil Co., at 19 Broad street, N. Y., March 25; Indian Rock Oil Co. at 71 Broadway, March 20; Crescent Petroleum Association, at 22 Prince street, March 18; Star Gold Mining Co. of Colorado, at 6 State street, to-day; Fulton Mining and Manufacturing Co., at cor. East Twelfth street and Avenue D, N. Y., March 20; East Bannock Gold and Silver Mining Co., at 17 Broad street, to-day.

STATEMENTS.

At the annual meeting of the Ashburton Coal company, held in Philadelphia, on the 12th inst., the following gentlemen were elected officers for the ensuing year:—President, Louis J. Belloni, Jr.; Secretary, John T. Rollins; Treasurer, John Martin, Jr. At a subsequent meeting Messrs. Jacob S. Rogers, John T. Rollins, J. M. Hutchinson, Louis J. Belloni, Jr., and John Martin, Jr., were elected Directors. We are pleased to learn that the affairs of the Ashburton company have passed into the hands of competent persons, and feel assured that the company's stockholders will not regret the change.

DIVIDENDS.

Crown Point Gold and Silver Mining Co., $80 (gold) per foot, due to-day; Imperial Silver Mining Co., $15 per foot (gold), due to-day, and payable at office Wells, Fargo & Co., N. Y.; Savage Mining Co., $100 (gold) per foot; Hale & Norcross, $125 (gold) per foot.

ASSESSMENTS

Iroquois Mining Co., at 60 City Exchange, Boston, $1 per share, payable May 1, with interest after that date; Calumet Mining Co., $5 per share, now due, payable at 114 State street, Boston, with interest after April 1.

Scientific Meetings.

AMERICAN INSTITUTE—POLYTECHNIC BRANCH.

JANSEN ON THE SPECTRUM OF VAPOR—GIBBS' MAP OF THE SOLAR SPECTRUM—FIRE DAMP EXPLOSIONS IN MINES—THE HARRISON BOILER—BRIDGE BUILDING.

Prof. S. D. Tillman, on taking the chair at the meeting of the Polytechnic on Thursday evening, communicated details of some interesting scientific theories which have been advanced lately, amongst which was that of Jansen, which differs from that offered by Sir D. Brewster and Father Secchi, S. J., on the spectrum of the water vapor. He noticed the new normal map of the solar spectrum, made by Prof. Gibbs, of Harvard. He read a condensation of an editorial article recently published in the JOURNAL OF MINING, upon the necessity of having geology taught in public schools. He then explained at length the cause of explosions in coal mines, arising from the ignition of air containing light carburetted hydrogen, known to non-scientific persons as "marsh gas," or "fire damp." He also explained an ingenious contrivance—the invention of Mr. G. F. Ansell, of London—by which miners may be forewarned of an impending explosion. In principle it is not unlike an ordinary barometer, the light carburetted hydrogen uniting with the air and pressing mercury contained in one leg of a U tube into the other, so that a platinum point is reached and electrical communication established. A dangerous accumulation of gas may be made known in two seconds.

Mr. Hyde explained at length, in a paper characterized by ability and accuracy, the principle of construction and advantages of the Harrison cast iron boiler. Our readers will remember having seen in our first volume an illustration of it. It is said to be absolutely safe from all danger of explosion. It is composed of a number of cast iron spheres, connected by a neck of the same material. The spherical form gives it immense strength, and each sphere is said to be in itself a small boiler perfectly safe. As cast iron is not as subject as wrought iron to the effects of corrosion—which a great English engineer says is as fatal to boilers as phthisis is to the human frame—this machine is likely to be almost free from deposits of rust. It can be conveniently cleaned by blowing the water completely out under high pressure. Another advantage claimed for it, is its facility of transportation. Mr. Hyde then invited a discussion of its merits and demerits. Mr. Lee asked for an explanation of its alleged failure in England. He answered that it was not put up there as Mr. Harrison wished. A gentleman who expressed himself strongly in favor of this boiler stated that he had recommended it, and in one case it had leaked so much that it had to be taken down. He added, however, that this appeared to be owing to the owner overworking it, expecting, through a spirit of false economy, a boiler of 30 horse power to accomplish the work of one of 50 horse power. Mr. Hyde explained the cause of these supposed failures, and the opinion of the meeting appeared to be that in the Harrison boiler a valuable addition has been made to the long list of steam generators already known to the public. Dr. Bradley maintained that the cause of all boiler explosions was the water falling too low. He wanted to know why there was not some means of detecting this. He was told, evidently to his surprise, that there were at least a hundred such detectors.

Mr. Holler, chief engineer of the Hudson River Railroad, exhibited a plan of a proposed viaduct across Cattaraugus creek, in this State. In height it would exceed the spire of Trinity church by at least twenty feet, being three hundred feet high. Mr. Blanchard then addressed himself to the solution of some of the mathematical questions arising in bridge building.

Original Papers.

[WRITTEN FOR THE JOURNAL OF MINING.]

The Manufacture of Mineral Oils from Coal and Other Bituminous Substances—No. 1.

HISTORICAL.

From the ethereal and fixed oils mineral oils distinguish themselves, in that they are not complete products of the vegetable organisms, but are products of decomposition of organic substances, either occurring naturally or generated artificially. The rapid progress made in the last decade in the art of producing mineral oils, and their increasing importance in the manufacture of photographic fluids, paraffine, lubricating oils, and coloring pigments, gives to them a high commercial value, as well as a remarkable place in modern industry. For the better elucidation of this extended branch of manufacture, it will be well to examine from the earliest times its history to the present day. It is doubtless a fact, that the inhabitants of different parts of our globe, were already, in the remotest times, acquainted with those naturally occurring oils and bituminous substances, known to us as Naptha, Bitumen, Asphaltum, Petroleum, etc. Heroditus mentions the oil wells of Zakanthus, the Zante, of the present day; Plutarch describes the phenomenon of a lake of burning petroleum in the vicinity of Eckbatana, and it is believed that the sacred fires, which blazed from the altars of the heathen, were fed with naptha, springing from the interior of the earth; and the holy fires at Baku (Province of Schirwan, Persia.) which have their origin in mineral gases, are yet the object of religious adoration. Similar phenomena are to be found in the vicinity of the Appenines, at Barigazzo, Bologna and Parma, in Italy; in the Cordilleras, in Hungary, Greece, England, and other countries, but more especially in the petroleum regions of the United States, to which we shall hereafter allude more particularly. Our knowledge of asphaltum is also derived from the earliest times, as the Jewish Kings made use of that which they skimmed from the surface of the Dead Sea, for building-cement. Again, at Egyptian Memphis, basements of houses were coated outside with asphaltum, so as to keep out the moisture; and according to the historian, Dioscorides, the platforms of the hanging gardens at Babylon were covered with asphaltum, before the loam was laid on. Still the ancients were not acquainted with the art of preparing illuminating materials. One Becher, physician to the court at Munich, gave, in his "*Närrischen Weisheit und Weisen Narrheit*, 1685," the first accurate account of the artificial production of pitch, tar, and oils. He also mentions that "coal, when subjected to distillation, yields a great and clear flame."* In 1694, Enle Hancock and Portlack made pitch, tar, and oil from a bituminous stone, and according to Lewis, author of a Materia Medica, oils were distilled, in 1761, from black shale, and prescribed as medicine. While the production of oil by distillation from coal has been increasing for more than a century, the purification of the products of distillation, and their application to industrial purposes, has made but slow progress, and even at this day is far behind perfection. The archives of the Royal Society in London, as well as the "Philosophical Transactions," besides many other writings, contain a large number of contemporaneous descriptive accounts relative to this growing branch of industry. As worthy of notice, we mention the essays of Lord Dundonald, written in 1781, with the idea of diminishing expenses in the preparation of coke, and the simultaneous saving of the volatile products. Coal was subjected to "destructive distillation" in coke furnaces, similar to those still in use. The volatile products of these furnaces were collected in a cooling tank, in which the tar was secured; and so soon as the illuminating qualities of the gases generated were detected by chance by a workman, they were at once used for lighting the works. Laurens, Reichenbach and others, subjected the tarry matters distilled from shales to a subsequent distillation, and Selligue at last succeeded in producing photogenic and lubricating oils from them. From that time the attention of chemists of all countries has been devoted to this subject, and many improvements have consequently been made in the purification of hydro-carbons. Of no little consequence to this manufacture was the discovery of the illuminating gas, which brought a new class of oils to the knowledge of chemists; and as both manufactures are in such intimate corelation, it might not be out of place to devote some lines to the history of the lighting gas. Although it follows, from the above-mentioned observations, and the essays of Becher, Hancock and

* Coals were first used in Germany over a century ago; but according to Marco Polo, the Chinese burned them in his time (1270). In England they were first used as fuel in the reign of Edward I., but the smoke generated by them was considered pestilential, and their further use was therefore prohibited by Act of Parliament in 1310.

Dundonald, that they were acquainted with an inflammable illuminating gas, generated by the dry distillation of organic substances, it would not be right to ascribe to them the honor of having discovered it, because the true value of a discovery is not based upon the observation of certain facts, but upon the appreciation of their uses to definite purposes. Even before Dundonald made the discovery, Dr. Clayton, in 1739, brought the first reliable communicatian as to the extraction of burning gas from coal before the public. Though Dr. Clayton was the first discoverer, it does not appear that he had any idea of its importance. About the same time Hales also obtained, by the same process, similar results. It was the then common belief that burning gases were only obtainable from coals, but in 1789 the French Engineer Le Bon proved that they could also be extracted from wood. He succeeded in lighting and warming his house by an apparatus constructed for the purpose, and called by him "Thermolamp," but he was not able to get a pure and faultless product. Contemporaneously with Dundonald, Bishop Watson made many attempts at distilling coal, and he has the credit of being the first, in his Chemical Essays, to determine the technical character of the products of coal distillation. He mentioned also the important fact that the gas thus obtained does not only retain its inflammability, but yields a much clearer light by passing it through water. But despite the discoveries of Clayton and Watson, it does not appear that, previous to 1792, there was any practical attempt to substitute coal gas for oil or tallow, as an illuminator. From 1792 to 1796, Murdoch was occupied in Redrush, Cornwall, with experiments with burning gases, obtained from coal, wood, peat, and similar substances. In 1798, he succeeded at last in lighting the cotton mill of Boulton & Watt, in Soho, near Birmingham, and it is only from this time that the history of illumination with gas commences.

[TO BE CONTINUED.]

[TRANSLATED FOR THE JOURNAL OF MINING.]

AMALGAMATION—No. IV.

By J. H. TIEMANN, M. E.

Three thousand six hundred kilos of lean ore, consisting of decomposed quartz, loam and oxide of iron, with finely pulverized metallic silver, hornsilver and silver glance, are mixed with about 315 kilos of magistral, consisting of 64 per cent. sea salt and 36 per cent. of green vitriol. This mixture is put into a wooden tub and constantly stirred till the mass is perfectly homogeneous. Sixteen of these tubs stand in a ow. Each day a fresh mixture is made. The first mixture is put into the next tub, and so on through he whole sixteen, a fresh mixture taking the place of the one removed. In passing from one tub to another, the mixture is passed through wooden rollers set close together, and is thus thoroughly triturated. In about sixteen days all the silver in the ore has been changed to a chloride, provided the magistral was properly made, and old, freshly-prepared magistral does not give good results. Now commences the European process proper. The mass is amalgamated in barrels, into which iron plates are thrown. The extraction of the silver is very complete, but there is a great loss of quicksilver. To the six methods already mentioned may be added, perhaps, a seventh, suggested by Mr. Lill, of Schnolnitz, for ores which contain metallic gold and silver in a finely divided state. It may be termed the amalgamation by a colum of quicksilver. The apparatus consists of a tube shaped like a horseshoe, open at the top, through which an endless hempen belt passes, running over a wheel above the tube. The tube is filled with quicksilver nearly to the top. The ore is introduced into the open mouth by means of a hopper or otherwise, and attaching itself to the belt, is carried by it through the quicksilver to the other mouth of the tube. In this way it passed through the quicksilver in very thin layers, affording opportunity for the gold and silver to come into immediate contact with the quicksilver.

REMARKS UPON THE THEORY OF AMALGAMATION.

In all amalgams, not only the quicksilver, but the gold, silver, etc., exist in the metallic state. Silver amalgam, therefore, is merely a combination of metallic quicksilver with silver, and when fully saturated, contains 65 per cent. quicksilver and 35 per cent. silver. The affinity of these two metals for one another is so great that if a piece of silver is laid on quicksilver, a film of amalgam is formed on the surface of the silver at the ordinary temperature, and without rubbing. If the silver is finely divided and tirturated with the quicksilver, the whole of it quickly amalgamates and dissolves in the excess of quicksilver. If this is pressed in a linen or leathern bag, the excess of quicksilver, with a trace of amalgam, goes through, and the amalgam, with a trace of free quicksilver, remains in the bag. The re-action is different when silver in combination with an acid is used. Quicksilver has scarcely any effect on the oxide or silicate of silver, and acts very slowly on the sulphide of silver. Only after being triturated for a long time does a decomposition begin, and not only amalgam but also sulphuret of quicksilver is formed, causing a loss of quicksilver, which amounts to more than an ounce for every ounce of silver. Hornsilver and quicksilver do not amalgamate at the ordinary temperature, but if the containing vessel be warmed, water added, and the mass is triturated, there gradually ensues an amalgamation, the more readily if the chloride of silver has been freshly precipitated. In this case the original compound of silver must be likewise decomposed, and when there is no other body present to effect this, it is effected by the quicksilver, a part of which combines with the silver, and anothe portion combines with the chlorine, forming a perchloride of mercury, which collects on the surface of the metal bath in the form of a grayish, wrinkled skin, and generally encloses small particles of amalgam. It might, therefore, be supposed that ores which contain the silver in a metailic state are best adapted for amalgamation; and this really is the case where the operation consists simply of a trituration of the ore and quicksilver. For direct amalgamation, the European method in barrels is just as little suited as the American method in heaps, as in both cases the contact of the silver and quicksilver is too incomplete, when we consider the large amount of ore through which the silver is dispersed. Amalgamation in mills (pans) is better adapted to such ores, in which every particle of the silver is brought into direct contact with the quicksilver. It must not be supposed, however, that the extraction of metallic silver in pans, is as complete as the extraction of gold, for the former does not amalgamate as readily as the latter, and this process cannot be used at all for such ores as contain the silver combined with an acid. It should not, therefore, cause any alarm, that though quicksilver was used for centuries in the extraction of gold it was very little used for extracting silver, even for ores containing metallic silver it was found more profitable to smelt them with lead, till chance and research discovered means of amalgamating with quicksilver. The amalgamation process had been used for centuries in South America, without any knowledge of the causes which effected the process, and even Van Born and Gellert overlooked the principal grounds upon which their process rested, their whole efforts were directed to converting the silver into the metallic state, and to oxidize the accompanying metals to prevent their amalgamation, and to remove the enclosing gangue by corrosion. Van Born found that simple roasting assisted materially in preparing the silver for amalgamation. The ores were rendered more friable, many of the volatile components were eliminated, other components were changed to sulphates, which were readily removed by solution in water, and this solution itself seemed to exercise a powerful corrosive inflence on the ores, thus rendering the amalgamation of the silver much easier. It was also found desirable, as far as possible, to reduce the other components to soluble salts, and the only question was, which acid could be most advantageously used for this purpose? Sulphuric acid suggested itself, as the ore usually contained a large amount of the material, sulphuret of iron, for its manufacture, but it was feared that it would attack the quicksilver and lessen its efficacy, and it was found that by using hydrochloric acid more of the gangue was dissolved, and that a great portion of the iron when combined with it was driven off in the roasting. In this way Van Born was led to use salt, as hydrochloric acid could be produced from it in the roasting, by the action of the sulphuric acid formed from the sulphuretes. By the use of these acids there would undoubtedly have been a great loss of quicksilver, had not first the copper from the kettles, then the copper and iron in the dashers, and finally the iron and copper plates in the barrels, protected the quicksilver from the action of the acids. It seemed to be so certain in this way that the silver came into the barrels in the metallic state, that hardly any trouble was taken to test it any further. It was likewise supposed that ores containing hornsilver were not adapted for amalgamation, for the reason that hornsilver is not reduced in roasting. Lampadius was the first who rectified these erroneous ideas. His valuable experiments with roasted ores prepared for amalgamation, proved that it was principally with chloride of silver with which he had to do, even when the unroasted ores contained no trace of it, and it was evident that the salt was the agent which effected the change.

TO BE CONTINUED.

MARKET REVIEW.

FRIDAY EVENING.

Gold and Silver Stocks.—Prices to-day exhibit but little variation from last week's quotations. The market to-day was quiet.

	March 8.		March 15.	
	Offered.	Asked.	Offered.	Asked.
Alameda	6 25	6 50	7 00	7 10
American Flag	1 10	....	90	1 10
Atlantic and Pacific	2 25	....	2 00	2 25
Bates & Baxter Gold	1 70	1 95	1 70	2 00
Benton Gold	1 00	....	1 70	1 75
Bobtail Gold	....	3 00	....	3 00
Boscobel Silver	....	4 75	....	4 50
Bullion Consolidated	....	1 50	....	1 50
Burroughs Gold	....	50	....	26
Central Gold	6	....	....	20
Crozier Gold	....	14	....	12
Columbian G. & S.	2 45	2 50	2 75	2 85
Consolidated Colorado	4	8	....	15
Consolidated Gregory	11 50	12 00	12 20	12 30
Corydon	....	6 00	....	....
Des Moines Gold	1 00	....	....	1 75
Downieville Gold	....	10	....	10
Gilpin Gold	....	3 00	....	3 00
Gold Hill	3 50	3 90	....	4 00
Gunnell Gold	4 00	4 75	4 50	4 75
Gunnell Union	50	54	51	55
Grass Valley Gold	....	....	....	....
Holman	5	....	15	....
Hope Gold	25	70	40	50
Keystone Silver	5	7	5	6
Kipp & Buell Gold	50	60	55	75
La Crosse Gold	50	70	50	65
Liebig	....	....	....	1 00
Liberty Gold	7	....	7	9
Montana Gold	30	....	35	45
New York	1 10	1 25	1 00	1 25
Nye Gold	....	8	....	8
Pahranagat Central Silver	....	....	....	....
People's G. & S. of Cal	1 00	2 00	1 10	1 50
Quartz Hill	4 05	4 10	3 90	4 00
Reynolds Gold	5	10	....	8
Rocky Mountain Gold	1 00	1 50	1 00	1 45
Smith & Parmelee Gold	6 00	....	6 10	6 20
Sensenderferfer	....	30 00	25 00	29 00
Symonds Fork	1 50	1 70	1 50	2 00
Texas Gold	20	30	....	3 30
Yellow Jacket	....	7	....	10

At the first Board the following were the sales: Benton, 200 shares at $1.65; Columbia Gold, s.500, at $2.80; 100, b.30, at $2.90; 100, b.3, and 300, s.3, $2.80; Keystone Silver, 500 at 6c; La Crosse Gold, 400 at 60c; Alameda Silver, 100 at $7.00, and 100, b.3, $7.05. At second call 300 shares of Alameda sold, b.3, at $7.10; 1100 American Flag, $1.05; 200 Atlantic & Pacific, $2.20; 100 Columbian G. & S., $2.85; 800 Consolidated Gregory, $12.10@12.25; 300 same, s.3, $12@12.20; 200 same, b.30, $12.10@12.25; 400 Quartz Hill, $3.95@4; 100 People's G. & S., $1.40.

Sales were as follows at the Second Board: American Flag, 100, b.80, at $1 05; Columbia Gold and Silver, 300, at $2 85; 200, b.30, at same figure; Consolidated Gregory, 800, at $12 50@12 75; 300 same, s.3, $12 50@12 55; 100, b.30, at $12 70; Hope Gold, 100, at 40; Keystone Silver, 1,000 s.3, at 54; Quartz Hill, 200, at $3 85@3 90; 200, s.3, $3 85; 100 same, b.10, $3 90; Smith & Parmelee, 100, at $6 10. At second call, 200 Alameda brought $7 10; 300 same; b.3, and 100, s.3, same rate; 200 Atlantic and Pacific, $2 25; 1,000 Keystone, s.3, at 5c; 300 Quartz Hill, at $3 90@3 95; 100, b.10, at $3 90.

Copper Stocks.	March 15.	
	OFFERED.	ASKED.
Caledonia	....	15 00
Canada Copper	50	75
Charter Oak Copper	1 48	1 52
Copper Falls	....	....
Davidson Copper	1 30	1 45
Ogima	....	5 00

100 shares Charter Oak sold at $1.50 to-day; Davidson touched $1.45 yesterday.

At second board, Charter oak sold at $1.50, and Davidson $1.40 1.45.

Lead Stocks.—100 shares Walkill sold to day at 70c; $2.90 was offered for Tudor, $3.25 asked.

Petroleum Stocks—Are dull and lower.

	March 8. Offered.	Asked.	March 15. Offered.	Asked.
Bennchoff Run	2 75	3 00	2 25	2 35
Buchanan Farm	15	22	....	20
Central	75	90	75	90
Clinton Oil	....	2 50	1 00	1 50
Excelsior	....	20	....	15
Manhattan	....	20	....	20
N. Y. and Alleghany.	....	4 50	....	4 50
Pit Hole Creek	....	75	....	75
Rynd Farm	6	15	6	20
United Pet. Farms	5	....	5	15
United States	3 75	4 25	3 70	3 80

Miscellaneous Stocks—Wells, Fargo & Co. sold at 64c yesterday. It was offered at 62½c to-day; Long Island Peat held at $3.00; Rutland Marble, $10 offered, $20 asked.

Foreign Excoange—Is dull. Bills at 60 days on London are quoted at 108@108¾ for commercial; 109@108¾ for bankers'; do. at short sight, 109¾@110; Paris at 60 days, 5.18¾@5.15; do. at short sight, 5.14¾@5.12½; Antwerp, 5.20@5.17½; Swiss, 5.18¾@5.17½; Hamburg, 36@36¾; Amsterdam, 41@41½; Frankfort, 41@47¼, Bremen, 78¾@79; Prussian thalers, 72@72¼.

Copper.—The market is firm, Lake & Baltimore ranging at 25½@26c. There is a large stock on hand, amounting to 4,000,000 lbs.

Iron.—The market has been variable. Scotch Pig sells at $42@43; American, $42@44. In retail prices there is a considerable reduction, as will be seen by comparing our present quotations with those of last week, as reported by Wm. Oothout & Co., of Cliff street: Swedish Iron, $170@172; common, $100@105; refined, $110@115; band, $140; rods, 3-16 to ⅜, $110@172½; scroll, ⅝ to ⅞, $140@190; horseshoe, $135@140; hoop, ⅝ to 2, $140@215; nail rod, 9@10¼c; ovals, ½ to 1¼, $135@145.

Steel.—Best American cast, 20@21c per lb. Hammer, 15c per lb.

Lead.—The market is dull. Silesian is quoted at 9½c currency. A moderate stock on hand.

Spelter.—The market in spelter is inactive, prices ranging at 9½c currency.

Tin.—We report the market as dull. Straits, 31@32c; Banca, 34@35c.

Quicksilver—Sells in lots at 85c, and in flasks at 90c.

Gunpowder.—Blasting, $5@5½.

Petroleum—Is in good demand for export. We quote crude, 40@47 gr., in bulk, at 11@11½c; do. do. in bbls. at 16@16½c; refined in bond, light straw, at 23½c; do. do. light straw to white, 24½c; do. do. prime light straw to white, 25½@26c; do. do. standard white, at 26½@27c; do. do. prime white, 28@27½c.

THE SLATE TRADE.

There is very little doing, and prices continue unchanged. Below we publish Messrs. Cook, Overfieldd & Snedeker's Report for February, which was received too late for insertion last week.

Roofing Slate.

Vermont purple,	1st	quality, per	square	.....	$11 50@12 50
" "	2d	"	"	.....	10 50@11 50
" green,	1st	"	"	.....	12 00@13 50
" "	21	"	"	.....	11 00@12 00
" red,	1st	"	"	.....	13 00@14 00
" "	2d	"	"	.....	12 00@13 00
Pa. bl'k & d'k blue,	1st	"	"	.....	11 00@12 00
" "	21	"	"	.....	10 00@11 00

PRICES DELIVERED.

				PER SQUARE.
CHICAGO.—Vermont purple and green,		1st qual.	....	$14 50@15 50
" " "		2d "	....	13 50@14 50
" " red		1st "	....	15 50@16 50
" " "		2d "	....	14 50@15 50
Penn. black		1st "	....	16 00@17 00
" "		2d "	....	15 00@16 00

BUFFALO.—$2 or $3 lower than Chicago.
CLEVELAND.—$1 higher than Buffalo.
CINCINNATI.—50 cents higher than Cleveland.
NEW ORLEANS.—$19@20 per square.
CHARLESTON, S. C.—$15@16 per square.

New York and Philadelphia Monthly Report of the Slate Market for February, 1867.

COOK, OVERFIELD & SNEDEKER, 35 DEY ST., N. Y., AND 405 COMMERCE STREET, PHILADA.

The Slate market during the month of February has been somewhat agitated. Roofing Slate manufacturers have been anxious to sell, and buyers induced to operate, only at prices reduced from fifty cents to one dollar per square, which will probably be the opening prices for the spring trade.

THE SCHOOL SLATE TRADE,

especially, has been affected by great fluctuations, occasioned by manufacturers, out and *inside*, the associations offering their stock on a dull market below regular rates, which has resulted in a tumbling down of prices some twenty per cent., thereby stimulating considerable activity in the trade. However, prices are becoming settled at reduced rates—which may awaken reflection and stimulate caution in manufacturers, by which they may avoid in future such disasters.

ROOFING.

Quantity used in the U. S. per annum, about	....	250,000	squares.
" manufactured	" "	200,000	"
" American Slates now in market	.....	12,000	"

Ruling price at the quarries during February, $7 to $7 50 per square, and in New York and Philadelphia, $7 to $9 50. Sales in excess of the product during the month.

SCHOOL.

Consumption in the U. S. and Canadas per an., about		30,000	cases.
Manufactured	" " " "	18,000	"
Number of cases on hand	.....	2,500	"
Manufactured in February	.....	600	"
Sales in February	.....	1,000	"

Supply fully equal to the demand at fixed list prices—regulated by percentum discounts—which will net about $12 per case.

BILLIARD BEDS.

Quantity used in the U. S. per annum about 3,000 set. Price of finished beds ready for the table $55 to $60 per set. Demand moderate, with tendency to lower prices.

MANTEL STOCK.

Quantity manufactured and used in the U. S. per annum about 500,000 square feet. Price per square foot, 35 to 40 cents. Sawed, planed and rubbed, and cut to pattern. Demand and supply constantly increasing.

BLACK-BOARDS.

Demand increasing, which is promptly supplied at fair prices, at 50 to 75 cents per square foot.

CEMETERY SLABS.

Fair demand, at low prices, which is mostly supplied at Southern ports from Europe. Price, from 22 to 25 cents per square foot.

TILING.

Supply in excess of the demand, but is growing in public favor, with more active inquiries for this season than heretofore. Slate Tile will wear longer, and is less liable to slipperiness than any article in use. Price per square foot, finished ready for laying, 40 to 60 cents.

BASES FOR LAMPS, &c.

These bases are enameled and finished in jet. The demand and supply is rapidly increasing, with prices remunerative to the manufacturer and satisfactory to the buyer.

WASHTUBS AND SINKS

are coming into general use, with a supply equal to the demand. Slate is admirably adapted to these purposes, and will soon become an important branch of the Slate business.

REFRIGERATORS.

Slate for refrigerators and meat boxes for hotels and restaurants is coming into use with great favor, and will soon require considerable quantities of Slate to meet the demands of the community.

THE COAL TRADE.

NEW YORK, Mar. 15, 1867.

Wholesale.—The demand for Domestic has been fair, but prices vary. There is considerable stock on hand, and a disposition to sell freely. There has been less call this season for manufacturing purposes, in consequence of the depressed state of all branches of trade. The trade this spring will be very light at the best. From all sections of the country we hear of the dulness in manufacturing lines, and this must necessarily affect the Coal interests in this city, which is so large a distributor. It is now definitely understood that the canals will open on the 18th inst.

Foreign.—The market is quiet, and we hear of very little offering. Prices rule firm. Freights are lower.

Provincial.—We hear of some contracts having been made for gas purposes, and note sales of 200 tons Sydney at $8 62½@8 75, currency, to arrive.

Retail.—Anthracite is in fair demand, with steady sales at $6 50@8 per ton.

The following is the quantity of Coal shipped over the principa Roads for the Week ending March 9, 1867:

	1866. WEEK.	1866. TOTAL.	1867. WEEK.	1867. TOTAL.	DECR'SE.
Phil. & Reading R.R.	....	608,748	57,609	499,117	209,631
Schuylkill Canal	....	.....	.....	.....	.....
Lehigh Val. R. R.	34,093	391,636	25,424	277,619	114,017
Lehigh Canal	....	.....	.....	.....	.....
Del & Hudson	....	.....	.....	.....	.....
Scranton North	6,324	60,595	7,536	61,419	814
Scranton South	18,523	142,011	26,036	209,656	67,955
Penn'a. Coal Co. Rail	.....	73,109	17,403	74,337	1,227
Wyoming North	.....	.....	.....	.....	.....
Wyoming South	....	.....	.....	.....	.....
Shamokin	10,357	58,357	4,533	48,626	9,731
Trevorton	1,228	6,887	543	4,409	4,478
Short Mountain	820	5,165	482	3,931	1,234
L. V. Co.	225	1,704	605	4,203	2,498
Broad Top	....	30,465	4,247	31,073	608
Williamsto'n	.....	.....	511	5,335	5,335
Total	.....	1,378,608	144,942	1220,035	.....
Cor'ng time last year	.....	.....	.....	1378,668	.....
Decrease	.....	.....	.....	158,633	.....

Lehigh and Mahanoy Coal Trade,

For week ending March 9, 1867.

NAMES OF SHIPPERS.	WEEK.	TOTAL.
Trenton Coal Co	.....	314 16
Mount Etna	.....	43 04
Mahanoy Coal Co.	.....	.....
Delano Colliery	1,460 04	14,386 13
Glendon Coal Co	366 16	2,412 15
Rathburn, Stearns & Co.	1,089 12	8,354 13
E. S. Silliman	935 10	22,486 17
McNeal Coal & Iron Co.	2,438 16	10,984 12
Knickerbocker Coal Co.	1,243 11	11,669 19
Thomas Coal Co.	257 08	3,168 18
Williams & Herring	329 17	2,446 00
Other shippers	.....	10 02
Total	8,121 14	76,278 09
Corresponding week last year	3,863 13	58,792 15
Increase	4,258 01	17,485 14
Decrease	.....	.....

Report of Coal

Transported over the Lehigh Valley Railroad, Week ending Saturday, March 9, 1867.

Where Shipped from.	Week. Tons. cwt.	Previously. Tons. cwt.	Total. Tons. cwt.
Total B. M. Region	5,982 07	86,106 06	92,088 13
Total Hazleton	37 10	17,640 15	17,678 05
Total Wyoming	12,327 03	80,183 04	92,510 07
Total Mahanoy	7,077 19	68,263 17	75,341 16
Total	25,424 19	252,194 02	277,619 01
Cor. week last year	34,093 08	357,543 05	391,636 13
Increase	.....	.....	.....
Decrease	8,668 09	105,349 03	114,017 12
Coal delivered at M. Chunk and forwarded by rail	25,424 19	252,194 02	277,619 01
Coal delivered on line of P. Haven and W. Haven R.R.	....	141 03	141 03
At Junction, for shipment by canal	....	89 06	89 06
At Mauch Chunk	5 19	75 11	81 10
At Mauch Chunk for shipment by canal	....	....	....
Grand Total	25,430 18	252,500 02	277,931 00
Cor. week last year	34,093 08	357,543 05	391,636 13
Increase	....	....	....
Decrease	8,662 10	105,043 03	113,705 13

Schuylkill Coal Trade.

BY RAILROAD, FOR WEEK ENDING MARCH 14, 1867.

St. Clair	19,338
Port Carbon	6,339
Pottsville	133
Schuylkill Haven	20,572
Auburn	613
Port Clinton	10,612
Total for week	57,607
Previously this year	441,510
Total	499,117

Cumberland Coal Trade.

Statement of Coal Shipments over the Baltimore and Ohio Railroad for the week ending March 9th:

From Cumberland and Pa. Railroad.	Tons.
American	1,905 02
Consolidation Company	754 02
Clifton	20 10
From Eckhart Railroad.	
Blaen Avon	132 00
Spruce Hill	446 19
	3,258 13
From Piedmont.	
Georges' C. C. & I. Company	520 05
Central	1,975 19
Piedmont	17 10
Swanton	1,289 14
Barton	1,080 16
Potomac	325 13
Georges' Creek Mining Company	1,149 12
Franklin	1,377 09
Hampshire	1,134 16
Atlantic	392 04
Total	9,263 18
Gas Coal.	Tons.
From mines West of Piedmont	1,190 00

Prices of Coal by the Cargo.

[CORRECLED WEEKLY.]

At New York, March 15, 1867.

Schuylkill Red Ash by Boat Load		$6 50@	$7 00
" Chestnut, " "		5 00	5 25
" White Ash Lump		6 00	6 25
" Steamboat		6 00	6 25
" Broken		5 00	7 00
" Egg		6 50	7 00
" Stove		6 50	7 00
" Chestnut		4 75	5 50
Lehigh White Ash Lump		6 50	7 00
" Broken		6 50	....
" Egg		6 25	....
" Stove		6 75	....
" Chestnut		5 50	....
Despard Gas Coal		10 00	....
Westmoreland Gas Coal		10 00	....
Blossburg & Fall Creek		7 25	7 40

At Philadelphia, March 15, 1867.

Lehigh Lump and Steamboat		$5 25@	.. ..
" Prepared		5 25	.. ..
" Chestnut		4 75	.. ..
Schuylkill Red Ash Prepared		5 00	5 50
" Chestnut		3 50	.. ..
" White Ash Lump and Steamboat		4 50	.. ..
" Broken		4 50	.. ..
" Egg and Stove		4 50	5 00
" Chestnut		3 75	4 00
Locust Mt. Lump. and Steamboat		4 50	5 00
" Broken		4 50	.. ..
" Prepared		4 50	.. ..
" Chestnut		3 75	.. ..
Lorberry Coal		5 00	.. ..
Shamokin		5 00	5 75
Franklin, (Lykens Valley)		5 50	
Broad Top		5 50	

Scranton Coal at Elizabethport, March 15, 1867.

Lump		$4 50@	— —
Steamer		5 00	— —
Grate		5 50	— —
Egg		5 25	— —
Stove		5 75	— —
Chestnut		4 50	— —

Prices for Pittston Coal at Newburgh, March 15, 1867.

Lump, per ton of 2240 lbs		$5 20	.. ..
Steamer, " " "	....	5 20	.. ..
Grate " " "	....	5 35	.. ..
Egg " " "	....	5 45	.. ..
Stove " "	....	5 70	.. ..
Chestnut "	....	4 40	.. ..

70 cents additional to New York.

Lackawanna at New York, March 15, 1867.

Lump	.. ..	@	.. ..
Steamer	.. ..	@	.. ..
Grate	6 50	@	.. ..
Egg	.. ..	@	.. ..
Stove	6 50	@	.. ..
Chestnut	.. ..	@	.. ..

Lehigh Coal at Elizabethport, March 15, 1867.

Lump	6 75@	.. ..	
Steamboat and Broken	6 00	— —	
Egg	6 00	— —	
Chestnut	5 00	— —	
Stove	6 50	— —	

George's Creek and Cumberland Coal.

Run of mine, f. o. b. at Locust Point	$5 60@	5 75	
At Georgetown	5 50	.. ..	

At Baltimore March 15, 1867.

Wilkesbarre & Pittston W. A., wholesale	$7 00@	$7 25	
" " retail	7 75	8 00	
Lykens Valley & Sunbury R. A., wholesale	7 00	7 25	
" " retail	7 75	8 00	

(From the Mercantile Gazette.)

At San Francisco, Feb. 16, 1867.

Duty Bituminous $1.25. Other kinds 40 cents per ton

Australian	$12 00@	....	
Do Wallsend	12 00	13 00	
Pittston, ton	14 50	.. ..	
Lehigh	18 00	.. ..	
Cumberland, cks	....	27 00	
do bulk	25 00	.. ..	
Scrantou	14 50	.. ..	
Liverpool	13 00	.. ..	
Scotch	14 00	.. ..	
West Hartly	12 00	.. ..	
Vancouver Island	13 00	.. ..	
Bellingham Bay	10 00	.. ..	
California	6 00	8 00	

Prices of Foreign Coals.

[REPORTED FOR THE JOURNAL OF MINING.]
BY H. L. PARMELE & BRO., 32 Pine street, N. Y.
Duty $1.25 per ton.

Liverpool Gas Caking	$10 50
" " Cannel	13 00
" House "	18 00
" " Orrel	16 00

Per ton 2240 lbs.
PRICES FROM YARD:

Liverpool Orrell, screened	20 00
" Cannel, "	22 00

per ton 2000 lbs. delivered.

Prices of Provincial Coals.

[REPORTED FOR THE JOURNAL OF MINING.]
BY LOUIS J. BELLONI, JR., 43 Pine street, N. Y.
Duty $1.25 per ton.

Block House (on board)	$1 75	gold
Gowrie "	1 75	"
Lingan "	1 75	"
Sidney "	2 28	"
Pictou "	2 25	"
Glace Bay "	1 87½	"
International Co.'s "	1 75	"
Slack Coal "	75@1 00	"

Coal Freights.

From Port Richmond, Philadelpia'h

Albany (& towing)	$1 80	@— —	Newburg	$1 68	@— —
Alexandria	1 60	— —	Newburyport	3 15	— —
Appanoag	2 00	— —	New Haven	2 00	— —
Aspinwall	— —	— —	New London	2 00	— —
Bangor	2 00	2 70	Newport	2 30	— —
Bath	3 00	— —	Newport. R. I.	2 10	— —
Baker's Landing	— —	— —	New York	1 60	— —
Bedford	— —	— —	Norfolk	1 60	— —
Boston	2 80	3 10	Norwalk	2 15	— —
Bridgeport	2 10	— —	Norwich	2 32	— —
Bristol	1 90	— —	Pawtucket. & tow'g	2 40	— —
Calais	3 50	— —	Petersburg	2 00	— —
Cambridgeport	3 50	— —	Philadelphia	— —	— —
Catskill (& tow)	2 00	— —	Portland	3 00	— —
Charleston, S. C.	2 25	— —	Portsmouth, N. H.	3 25	— —
Charlestown	3 50	— —	Providence	2 10	— —
Chelsea	2 50	— —	Provincetown	1 90	— —
Commercial Point	2 30	— —	Poughkeepsie, & t'g	1 60	— —
Diversport and dis.	2 00	— —	Port Chester	1 60	— —
Delaware City	— 80	— —	Plymouth	2 25	— —
Dighton	2 00	— —	Richmond	2 00	— —
East Greenwich	2 10	— —	Rockland	— —	— —
Elizabethport	— —	— —	Roxbury	3 40	— —
Fall River	2 10	— —	Saugus	2 50	— —
Fort Monroe	1 60	— —	Sing Sing	1 60	— —
Fredericksburg	1 75	— —	St. Johns (in gold)	2 00	— —
Georgetown	1 90	— —	Salem	3 05	— —
Gloucester	2 15	— —	Savannah, Ga	2 25	— —
Lynn and dis	3 00	— —	Stonington	2 25	— —
Milton	3 75	— —	Washington, D. C.	1 55	— —
Malden	3 60	— —	West Point & tow	1 70	— —
Mobile	5 10	— —	Wilmington	1 00	— —
Neponsett	3 15	— —	Williamsburg	2 87	— —
New Bedford	2 30	— —	Winterport	2 00	— —

From Newburgh.

Albany	55	@ . .	Norwalk	1 20	@. .
Barrytown	40	@ . .	Norwick	1 45	@. .
Boston	2 00	@. .	Nyack	50	@. .
Bridgeport	1 25	@ . .	Pawtucket	1 70	@. .
Bristol	1 45	@ . .	Peekskill	40	@. .
Catskill	40	@ . .	Poughkeepsie	25	@. .
Cold Spring	30	@. .	Providence	1 50	@. .
Coeymans	50	@ . .	Rhinebeck	30	@. .
Coxseckie	45	@ . .	Saugerties	40	@. .
Dighton	1 50	@ . .	Sing Sing	50	@. .
Fall River	1 45	@ . .	Stamford	1 25	@. .
Fishkill Landing	20	@ . .	Stonington	1 35	@. .
Greenbush	55	@ . .	Stuyvesant	45	@. .
Haverstraw	45	@ . .	Tarrytown	50	@. .
Hudson	40	@ . .	Troy	60	@. .
Mystic	1 35	@. .	Warren	1 50	@. .
New Haven	1 25	@. .	West Point	30	@. .
New London	1 35	@. .	West Troy	60	@. .
Newport	1 45	@. .	Yonkers	55	@. .
New York	70	@. .			

From Georgetown or Alexandria.

To Philadelphia	$2 50	— —	Boston	3 50	3 75
New York	3 25	3 50			

From Elizabethport.

Albany	$1 00	@— —	New London	1 25	@— —
Boston	2 00	— —	Newport	1 50	— —
Bridgeport	1 00	— —	New York	55	— —
Fall River	1 50	— —	Norwalk	1 00	— —
Hartford	1 50	— —	Norwich	1 30	— —
Hudson	1 00	— —	Pawtucket	1 75	— —
Lynn	— —	— —	Portland	2 00	— —
Middletown	1 25	— —	Portsmouth	2 15	— —
New Bedford	1 50	— —	Providence	1 50	— —
Newburyport	2 25	— —	Salem	2 00	— —
New Haven	1 00	— —	Taunton	1 40	—

From Baltimore.

To Philadelphia	$2 50	@— —	Boston	3 75	@— —
New York	2 25	— —			

By Railroad.

Transportation from Schuylkill Haven to Pt. Richmond	$2 08
Freight from Pt. Richmond to New York	1 60
Total	$3 68

From Port Carbon 8 cents per ton more.

Freights on Coal to Elizabethport.

L. V. R. R. from Mauch Chunk to Easton	$1 15
C. R. R. of N. J., Easton to Elizabethport	1 66
	2 85
Shipping expenses at Elizabethport	30
Total	$3 11

Provincial Freights.

	Currency.
Sydney to N. Y.	$3 50
Lingan	3 75
Cow Bay	3 75
Big Glace Bay	4 50
Little "	3 75

Foreign Freights.

New Castle and Ports on Tyne	18£@ keel.
Liverpool	15s.@

COPPER ORES.

BALTIMORE, Mar. 15, 1867.

Owing to a heavy decline in copper, there is at present no demand for copper ores, and sales could only be forced at—

$3 50 for	15@20
3 75 "	20@30
4 00 "	30 and over.

BOSTON STOCK MARKET.

(By Telegraph.)

BOSTON, March, 15, 1867.

Prices bid to-day were as follows:

Canada	50c.	Minnesota	9
Copper Falls	23	Quincy	34
Franklin	..	Cary Improvement	8⅝
Hancock	8½	Rockland	..
Huron	17	Water Power	24⅞
Isle Royal	8	Central	..

Sales at Boston Stock Exchange, March, 14.

5 shs	Allouez	5½	200 shs	Humboldt	1⅛
200 do	Cary Imp	8¾	100 do	do	1⅛
400 do	Canada	6 00	400 do	Petheric	2
100 do	Concord	2¾	400 do	do. b.60	2⅛
400 do	Copper Fs	22	50 do	Pewabic	20
100 do	do. b.30	22¾	50 do	do	19⅛
100 do	do. b.10	22	150 do	do. b.60	20
50 do	do	23	50 do	Phœnix	5
300 do	do. b.30	23	100 do	South Side	1⅛
150 do	do	22½		SECOND CALL.	
50 do	Huron	18½	160 do	Hancock	8¼
200 do	do	28	50 do	do	8⅜
50 do	do	17½	200 do	Allouez M	5½
100 do	do. b.30	18	100 do	do. b.30	5¾
150 do	do	17	50 do	do	5⅝
100 do	Native	2	100 do	Rockland b.60	9½

SAN FRANCISCO STOCK MARKET.

Latest by Telegraph.—March 14.

Name.	Bid per foot.	Name.	Bid per foot.
Gould & Curry	465	Crown Point	900
Savage	1900	Yellow Jacket	825
Chollar-Potasi	250	Belcher	125
Ophir	235	Alpha	125
Hale and Norcross	3000	Imperial per share	210
Cal. Steam Navigation Co.	65	Cal. State Telegraph Co	31

WEEKLY COAL TRADE CIRCULAR.

NEW YORK, March 15, 1867.

The canals are advertised to open March 18th. After this date—weather permitting—the trade will be in full blast. All the indications point to a dull opening and low prices. But little encouragement exists for miners to resume—as labor, although low as can reasonably be looked for on a basis of $16 per barrel for flour, is too high to enable miners to produce coal at current market rates profitably. Shrewd buyers, no doubt, will take advantage of the present condition of things, and secure their coal while the opportunity offers, at present low prices, as it would seem certain that coal must advance to compare relatively in value with other leading necessaries of life, unless a general shrinkage of values occur, so as to allow of further reductions in the rates of labor.

P.

Mining Summary.

[Continued from Page 391.]

late and foster trade, enterprise, and production, and therefore, conducing, with greater and greater force, to neutralize by extension of the surface to be covered, and by multiplying indefinitely the number and magnitude of the dealings to be carried on, the *a priori* tendency of an increase of metallic money to raise prices by mere force of enlarged volume. Already the boundaries within which capital and enterprise can be applied, with the assurance and knowledge alone compatible with durable success, have been extended over limits which ten or even five years ago would have been regarded as unattainable. There have come into play influences by which it seems to be the special purpose to contribute, by the aid of the concurrent advance of knowledge, to the removal or mitigation of many chronic evils against which past generations have striven almost in vain."

TRANSPORTATION FROM THE MISSOURI RIVER TO THE ROCKY MOUNTAINS.

While postponing a detailed consideration of the character and extent of trade and transportation from the Missouri river to the mining territories of the interior since 1848, some idea of the westward movement of merchandise, and the cost of transportation, may be obtained from the Quartermaster General's report to the Secretary of War for the year ending June 30, 1866, which exhibits the transportation on account of government, and the rates paid per hundred pounds per hundred miles. The rates from the Missouri river to northern Colorado, Nebraska, Dakota, Idaho, and Utah were $1 45; to southern Colorado, Kansas, and New Mexico, $1 98, with an addition from Fort Union in New Mexico to posts in that territory, in Arizona, and western Texas of $1 79 per hundred pounds per hundred miles. The total number of pounds transported was 81,489,321 or 40,774 6-10 tons, at a cost of $3,314,495. Parties familiar with the course of this inland trade, estimate that the transportation on account of government is one-ninth the total amount of transportation. At this rate the whole amount paid in 1866 for freights from the Missouri river westward was $30,840,055. According to a statement recently made by the officers of the California division of the Union Pacific Railroad $13,000,000 in gold was paid in 1863 for transportation eastward from San Francisco to the State of Nevada and Territories east of the Sierra Nevada. The details of return freights and the amount paid for the movement of passengers are, as yet too incomplete for publication. Not less than $50,000,000 per annum is expended on or near the line of the Union Pacific Railroad for the transportation of travellers and merchandise.

GENERAL OBSERVATIONS.

I beg leave to close this communication with a few observations of a general nature:

1. There are two indispensable requisites to the development of the western mines—security from Indian hostilities, and the establishment of railway communication to the Pacific coast on the parallels of 35°, 40°, and 45°. Of these, the completion of the "Union Central" on the average latitude of the fortieth parallel may be anticipated in 1870, and will unquestionably give a great impulse to the communities which it will traverse, probably in such a degree as to warrant the immediate construction of a northern line central to Minnesota, Dakota, Montana, Idaho, Washington and Oregon, and a southern line equally indispensable to the Indian Territory, Texas, New Mexico, Arizona, and southern California.

2. Great results of a social, no less than a material character may be anticipated from the act of July 26, 1866, extending facilities for acquiring title to mineral lands. By that act, freedom of exploration, free occupation of government lands for placer mining, a right to pre-exempt quartz lodes previously held and improved according to local customs or codes of mining, the right of way for aqueducts or canals, not less essential to agriculture than to mining, and the extension of the homestead and other beneficent provisions of the public land system in favor of settlers upon agricultural lands in mineral districts, have been established as most important elements for the attraction of population, and the encouragement of mining enterprises. The Commissioner of the Land Office has carefully analyzed this enactment, and greatly facilitated its execution by a circular recently issued. The spirit of the legislation under consideration is in the interest of actual settlement and occupation, and adverse to absentee ownership for merely speculative purposes, of mining properties. It will probably be necessary to supplement the act in question by some general revision of the local mining customs, which, although generally founded on the Spanish code so long in use in Mexico, are often incongruous and obscure.

3. Great loss and disappointment have resulted from the unique geological and mineralogical development of auriferous and argentiferous lodes of the Rocky Mountains and the Alleghanies. Metallurgical machinery and methods which had been successful in Europe, and even in California, have proved inapplicable or met with unexpected obstacles in the reduction of ores. There is no subject of greater importance than a scientific analysis of the situation and combination of the precious metals and the best methods for their treatment. How far Congress, or any executive department, can judiciously co-operate in the solution of the mechanical and chemical problem which now confronts the skill and experience of all interested in the economical reduction of the ores of gold and silver, it is not within the province of this report to determine; but the great utility of the geological survey of Lake Superior and the Upper Mississippi, in 1847, under the direction of Professor D. D. Owen, may properly be referred to as suggesting the expediency of a similar exploration under national auspices of the mineral districts of the western States and Territories, and which might be appropriately extended to include the metalliferous localities of the Alleghanies.

JAMES W. TAYLOR.
HUGH MCCULLOCH, Secretary of the Treasury.

Patent Claims.

Interesting to Miners, Millmen, Metallurgists, Oil-Men and Others.

The following claims have recently been issued from the United States Patent Office:

62,464.—APPARATUS FOR THE MANUFACTURE OF BROMINE AND IODINE.—David Alter, Freeport, Pa.

I claim the stone box and lid, with iodine leaden flue, as above described, to be employed as a retort for the manufacture of bromine and iodine.

62,469.—APPARATUS FOR PREPARING PEAT FOR FUEL.—Leander W. Boynton, Hartford, Ct.

1st. I claim the combination of the grinding cylinder, c and b, with the spurred rollers, or rollers and spurred apron, and hopper, B, and when they are constructed, arranged, and fitted for use, substantially as herein described and set forth.

2d. I claim the combination of the perforated pipe, j, for the high steam with the apron, D D, and the exhaust fan, C, when they are constructed, arranged, and fitted for carrying and drying the peat, substantially as herein described and set forth.

3d. I claim the moulding and pressing cylinder, D, as described in my Patent, issued December 27, 1864, in combination with the apron, F, and zig-zag pipe, p, when they are constructed, arranged, and fitted for moulding and drying peat, substantially as herein described and set forth.

62,508.—TUBE DRIVING OR BORING WELLS.—Esau D. Taylor and William H. Ballou, Hornellsville, N. Y.

We claim the combination of the head or cap, C, chain, B, wire rope or cord, with a series of jointed plugs, a a, and barrel, A, substantially in the manner as herein described for the purposes set forth.

Special Scientific Brevities.

☞ Dr. Sterry Hunt, F. R. S., says: The revelations of the spectroscope demonstrate that the same chemical elements are common to the earth, the sun, and the fartherest stars, and that matter exists throughout space as luminous gas (nebulæ), and condensed into luminous suns and non-luminous planets, three conditions, through which, according to the nebular hypothesis, all matter must pass in the process of condensation. There are potent arguments in favor of this hypothesis, which is supported by so many astronomical reasons, and which supposes that not only the bodies of the solar system, but all those which astronomy makes known to us, had a common origin from a vaporous mass which once filled immensity.

☞ Volcanic eruptions have their seat, not in the original nucleus, which is solid, but in the deeply-buried strata heated by this nucleus, and are no more than pustules or cutaneous eruptions of the earth's surface. Active volcanoes are only met with in or near regions where the accumulation of sedi-

mentary rocks has been great in comparatively recent geological periods, that is to say, where there are great thicknesses of newer secondary or tertiary rocks. Hence their absence from eastern America, and their occurrence along its western coast. As, by the chemical action of heat, the deply buried strata are exhausted, volcanoes become extinct.—*Ibid.*

☞ **The conclusions as to the solidity of the earth's** centre, deduced from chemical and physical considerations, are further supported by the astronomical calculations of William Hopkins on the phenomena of procession and nutation, those of Thompson on the tides, and those of Pratt on the pressure of mountain masses on the earth's surface, all of which conduce to the conclusion that the earth, if not solid to the centre, must have a solid crust two thousand miles or more in thickness. The heat of the mass beneath the cooled surface is still nearly that at which the matter congeated; the loss of heat by radiation now proceeds very slowly.—*Ibid.*

☞ **Internal heat, slowly conducted upwards, alters,** crystallizes and metamorphoses the sedimentary rocks, and with the aid of water everywhere diffused, gives rise to a soft and pasty layer, upon which the solid upper strata repose. From this softened layer have come the eruptive and scotic rocks which are portions of these unlike sedimentary beds, displaced and forced upward through fissures. Many of these beds are of such mixed composition as to yield, by their fusion, great volumes of various gases, which, finding vent, together with the fused rocks or lavas, give rise to volcanic phenomena.—*Ibid.*

All Sorts.

☞ **In England the people are complaining bitterly** of what they have to pay for royalty, the items of which are thus set down: The Queen's expenditures, including her Civil List, $1,925,000 a year; the Duchess of Cambridge, $30,000; the Grand Duchess of Mecklenburg-Streilitz, $15,000; the Duke of Cambridge, $60,000; Princess Mary of Cambridge, $15,000; the Princess Royal, $40,000; Princess Alice, $30,000; the Prince of Wales, $200,000; the Princess of Wales, $50,000; the King of Belgium, $250,000; all of which amounts to an annual total of $2,615,000, and is swollen by other personal pensions to $3,000,000.

☞ **A series of experiments are now being carried** on by the Madras Government for raising and propagating the pearl oyster. It is claimed that there is no more trouble in raising the pearl than the common oyster.

☞ **A would-be agreeable, taking his seat between** Madame de Stael and the reigning beauty of the day, said, "How happy I am to be thus seated between a wit and a beauty!" "Yes," replied Madame de Stael, "and without possessing either."

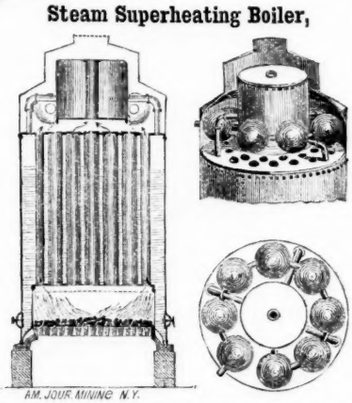
SPECIAL NOTICES.

☞ The San Francisco *Mining and Scientific Press*, an excellent paper, comes to us in entirely new dress. It is now printed on the first type ever made on the Pacific coast, and presents a highly creditable appearance in every way.

☞ John Johnson, Esq., of Saco, Maine, advertises in another column for a few thousand dollars, to assist him in carrying out an enterprise of great magnitude.

DAVIS' PATENT

Steam Superheating Boiler,



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R. W. DAVIS, Gen. Superintendent.

☞ Send for Illustrated Circular. 25:2:xm

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A copy of the regulations, and further particulars, will be furnished on application to the undersigned.

All Competitors must furnish the Machines intended for Trial, in Lancashire, not later than the 1st November, 1867.

MASKELL WM. PEACE,
Wigan, Law Clerk to the Association.

Feb. 11, 1867. 25:2:4t

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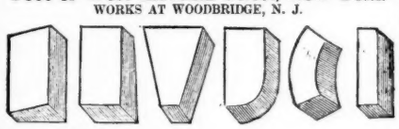

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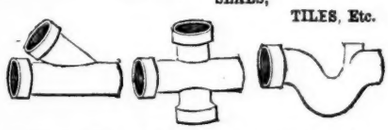

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He refers to the Hon. Stephen J. Field, Associate Justice of the Supreme Court of the United States.
Jan. 1, 1867. 18:12qp

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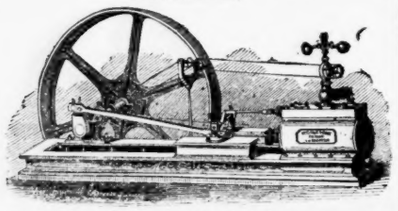

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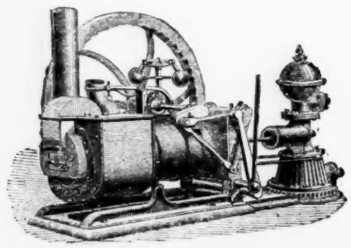

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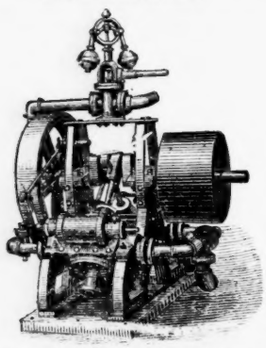

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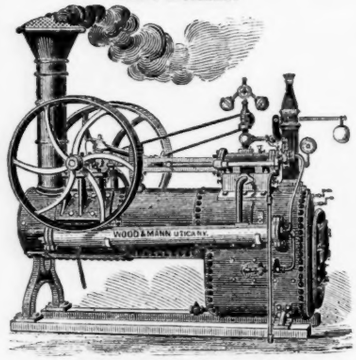

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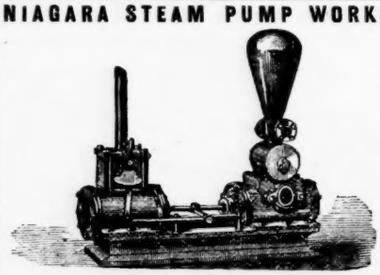

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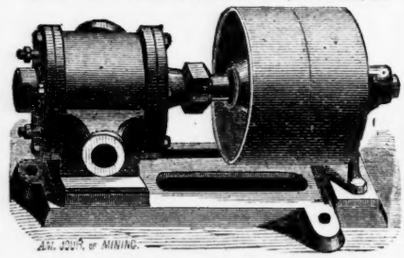

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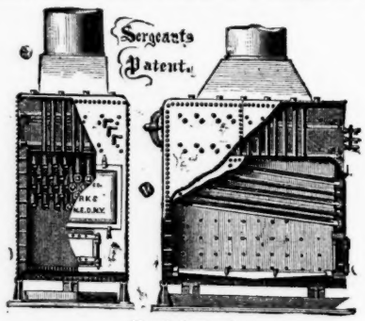

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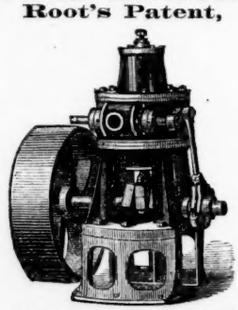

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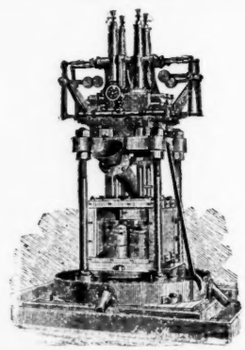

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